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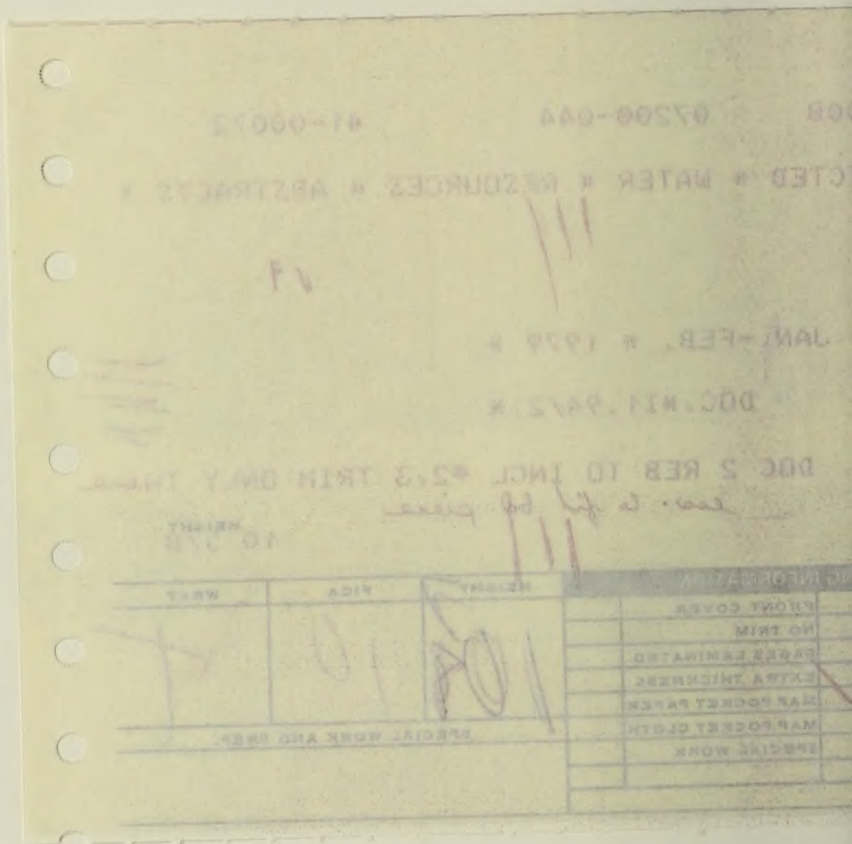

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 1
JANUARY 1, 1979

W79-00001--W79-00500

etary of the U.S. Department of the Interior has de-
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n of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

. NATURE OF WATER

B. Aqueous Solutions and Suspensions

NVESTIGATIONS OF THE MOLECULAR EIGHT, FREE RADICAL AND METAL IN-ERACTIONS OF ISOLATED AQUATIC AND OIL FULVIC ACID,
ew Hampshire Univ., Durham.
A. Wilson.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-288 085, ice codes: A07 in paper copy, A01 in microfiche.
aD Dissertation, August 1977, 131 p, 11 fig, 7 tab, 3 ref, append. OWRT-A-035-NH(4), 14-31-0001-29.

escriptors: *Humic acids, *Acidic soils, Chemical reactions, *Fulvic acids, *Acidic ater, Chemical analysis, Metals, Organic acids, oil profiles, Podzols, Acidity, Spec-ophotometry, Molybdenum, *Molecular weight, Free radical, Cryoscopic analysis, Electron ramagnetic resonance, Spin concentration, anadium.

oil and aquatic fulvic acid were isolated from a 3 orizon and a Podzol soil and the Oyster River in ee, N.H., respectively. The isolated materials ere characterized initially by total acidity, func-onal group (carboxyl, carbonyl), elemental ,H,N) and UV-visible spectrophotometric alyses. The molecular weights of soil and quatic fulvic acids were determined using a cryo-opic method analysis. Data were corrected for e dissociation of carboxyl groups. Dissociation orrected number average molecular weights of 4 and 626 were obtained for soil and aquatic ful-c acid, respectively. Additional studies were per-ormed on the free radical specie associated with lvic and humic acids. Electron paramagnetic sonance (epr) spectra for soil fulvic and humic ids reveal an unsymmetric first derivative signal ith g-values of 2.0037 + 0.0002 and line widths of 3 to 5.6 Gauss. Analysis of the relative spin con-ntration revealed a free radical concentration ttern; soil humic acid, aquatic humic acid, soil lvic acid, aquatic fulvic acid. Deoxygenated queous solutions of soil and aquatic fulvic acid ere titrated with base to determine any change in e free radical concentration as a function of pH. he free radical signal showed a dramatic increase intensity at pH values greater than 8. A Hender-on-Hasselbalch equation was used to explain in-reases in the free radical concentration with pH. was proposed that quinone and hydroquinone olecules interact to produce semiquinone olecules at high pH.
79-00436

. WATER CYCLE

A. General

ODELLING THE WATER QUALITY OF THE YDROLOGICAL CYCLE.
or primary bibliographic entry see Field 5B.
79-00379

GENERAL TWO DIMENSIONAL RIVER IMULATOR,
Vaterloo Univ. (Ontario). Dept. of Systems esign.
or primary bibliographic entry see Field 2E.
79-00397

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00447

POTENTIAL AND LIMITATIONS OF RAINFALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS,
Papua New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 87-102, 1977. 6 fig, 5 tab, 22 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Mathematical models, Watersheds(Basins), Rivers, Mountains, Rainfall, Storms, Precipitation(Atmospheric), Runoff, Foreign countries, Foreign research, Streamflow, Gaging stations, Stream gages, Rain gages, Calibrations, Hydrology, *Papua New Guinea, *Papua New Guinea Highlands.

A modified version of the Boughton model was calibrated for the Tua River Basin in the Papua New Guinea Highlands. The same model parameters then were used to calculate runoff from rainfall for 7 other basins to see whether it is possible to transfer model parameters between similar basins. Model parameters could be transferred successfully between similar basins where low flows are concerned, but higher flows were not always reproduced successfully. (Sims-ISWS)
W79-00491

2B. Precipitation

IS CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER.,
Illinois Univ. at the Medical Center, Chicago.
For primary bibliographic entry see Field 5A.
W79-00013

DETERMINATION OF CHRYSOTILE ASBESTOS IN RAINWATER,
Illinois Univ. at the Medical Center, Chicago.
For primary bibliographic entry see Field 5A.
W79-00014

A TECHNIQUE FOR ESTIMATING CLOCK TWO-HOURLY PRECIPITATION RATE DISTRIBUTIONS,
Air Force Environmental Technical Applications Center, Scott AFB, IL.
D. J. McMorrow.
Report USAFETAC-TN-78-002, May 1978. 13 p, 4 fig, 6 tab, 21 ref.

Descriptors: *Metorology, *Rainfall, *Precipitation atmospheric, *Rainfall intensity, *Clock-hourly precipitation, *Clock two-hourly precipitation, *Precipitation intensity, Weather patterns, Microwaves, Weather data, Climatic data, Distribution patterns, Radio waves, Analytical techniques.

Because precipitation, particularly rainfall, is one of the most significant attenuators of microwave transmissions, accurate estimates of mean rainfall rate distributions along lines of varying lengths is desirable. A method for estimating rainfall distributions over long path lengths is described that shows how clock two-hourly precipitation rate distributions can be derived from distributions of clock-hourly precipitation rate distribution using negative exponential functions. The analytical conversions are provided for 16 climatic regimes in the continental United States and Alaska. Also, the clock-hourly and two-hourly precipitation rate distributions are compared with instantaneous distributions measured over horizontal paths. Examination of the instantaneous rainfall rate distribution along lines in central Illinois indicated that the 1950 hypothesis of Bussey on the point-time ergodicity of rainfall rate distributions may require some adjustment, although the basic assumptions appear reasonably valid. (Majtenyi-IPA)
W79-00089

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, ANNOTATED BIBLIOGRAPHY.
For primary bibliographic entry see Field 10C.
W79-00106

LOCAL DIFFERENCES IN THE PATTERNS OF VARIABILITY OF TROPICAL RAINFALL: SOME CHARACTERISTICS AND IMPLICATIONS,
University of New England, Armidale (Australia). Dept. of Geography.
I. J. Jackson.
Journal of Hydrology, Vol. 38, No. 3/4, p 273-287, August 1978. 6 fig, 8 tab, 21 ref.

Descriptors: *Rainfall, *Tropical regions, *Variability, Data processing, Correlation analysis, Analytical techniques, Networks, Rain gages, Watersheds(Basins), Rain, Spatial distribution, Daily hydrographs, Monthly, Annual, Weather, Meteorology, Hydrology, Inter-station differences.

The paper illustrated that for time periods of a month or longer, variability patterns of tropical rainfall can differ considerably at nearby locations (i.e., less than 1 km to 20 km). This is so even when stations are in an area of uniform relief and their long-term averages are similar. At one station, rainfall in a particular month or season can be well above average but below average at a station a few km away. The degree of 'localness' of variability patterns is much greater in the tropics than in higher latitudes. This fact is particularly important when the small scale of peasant agriculture in the tropics is considered. It is also significant for rainfall measurement and analysis. (Sims-ISWS)
W79-00113

RAINFALL FREQUENCIES FOR THE PERSIAN GULF COAST OF IRAN,
Dames and Moore, Denver, CO.
U. Kappus, J. M. Bleek, and S. H. Blair.
Hydrologica Sciences Bulletin, Vol. 23, No. 1, p 119-129, March 1978. 2 fig, 4 tab, 19 ref.

Descriptors: *Rainfall, *Probable maximum precipitation, *Duration curves, *Foreign countries, Precipitation(Atmospheric), Frequency, Watersheds(Basins), Statistical methods, Analysis, Model studies, Foreign research, Depth, Analytical techniques, *Iran, *Persian Gulf(Iran), Rainfall depth-duration relationships.

This analysis was undertaken to develop appropriate extreme flood design criteria for a nuclear power plant at Halileh, near Bushehr, Iran, adjacent to the Persian Gulf. Graphical relationships presented provide a convenient means of estimating the probable maximum precipitation and the 2- to 100-year return period rainfall events with durations from 5 min to 24 h. The relationships may be applied for drainage areas up to 25 sq km. Probable maximum precipitation and 2- to 100-year return period rainfall events were estimated. Precipitation depth-duration relationships were derived. The depth-duration-frequency relationships should not be applied to more moun-

tainous areas inland from the Persian Gulf without adjustment for orographic effects. Data used for the estimation of probable maximum precipitation and rainfal depth-duration-frequency relationships, were: (1) precipitation-monthly, daily, and hourly; (2) dewpoint temperature-maximum persistent 12 h values; (3) upper air data-wind and temperature; and (4) annual number of days having thunderstorms. (Humphreys-ISWS)
W79-00123

AN ESTIMATE OF ANNUAL RUNOFF FROM ENGLAND AND WALES, 1728-1976,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 2E.
W79-00124

SOLID STATE EVENT RECORDER FOR RAINFALL MEASUREMENT,
Institute of Hydrology, Wallingford (England).
M. Turner, and G. P. Brunsdon.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 143-149, March 1978. 5 fig.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Rain gages, *Instrumentation, Measurement, Precipitation gages, Foreign research, Electronic equipment, Equipment, *United Kingdom, Tipping bucket rain gage, Event recorder.

A solid state event recorder and a reader suitable for use with a tipping bucket raingage were described. The recorder is a small battery operated unit with very low power consumption, capable of recording 64, 8 bit, words. A portable reader unit was used to interrogate it. (Humphreys-ISWS)
W79-00125

A STORM RAINFAL PATTERN ABOVE THE CENTRAL AFRICAN PLATEAU,
Corporation for Engineering, Geological and Hydrological Investigation, Prague (Czechoslovakia). Stavebni Geologie.
J. Balek.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 151-156, March 1978. 2 fig, 4 tab, 7 ref.

Descriptors: *Rainfall disposition, *Africa, *Tropical regions, *Rainfall, Spatial distribution, Temporal distribution, Analysis, Depth-area-duration analysis, Thunderstorms, Foreign research, *Central African Plateau.

The spatial and temporal distribution of tropical rainfall above a small tropical basin on the Central African Plateau was studied by using a dense network of rainfall recorders. Rainfall on the plateau is associated with thunderstorms, and most of the daily totals originate from rains of a short duration. The resuls indicated a high variability of the rainfall pattern within a small area of less than 5 sq km. Formulas for the calculation of the rainfall rate and depth-area-duration relationship were presented for the purpose of network construction and engineering design in tropical Africa. (Humphreys-ISWS)
W79-00126

ACID PRECIPITATION IN THE NETHERLANDS,
Department of Environmenta Control, Haarlem (Netherlands).
For primary bibliographic entry see Field 5A.
W79-00138

HAILSTONE SIZE INFERRED FROM DENTS IN COLD-ROLLED ALUMINUM SHEET,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
For primary bibliographic entry see Field 7B.
W79-00139

CLIMATOLOGY OF INSTANTANEOUS RAINFALL RATES,
Illinois State Water Survey, Urbana.
D. M. A. Jones, and A. L. Sims.
Journal of Applied Meteorology, Vol. 17, No. 8, p 1135-1140, August 1978. 5 fig, 2 tab, 3 ref. AFCRL F19628-69-C-0070, F19628-72-C-0052.

Descriptors: *Rainfall, *Rainfall intensity, *Frequency curves, *Climatology, Rain, Rates, Precipitation(Atmospheric), Rain gages, Instrumentation, Data processing, Precipitation intensity, Meteorology.

Raingage records from four climatic zones (maritime subtropical, continental temperate, maritime temperate, and midlatitude interior) were analyzed to study instantaneous rainfall rates as defined by 1 and 4 min accumulations. The frequency distribution of rainfall rates was determined for stations in each of these climatic zones, and a zonal average frequency distribution was calculated. A progression in the frequency of more intense precipitation was found from the North Pole to the Equator since all of the data were taken from the Northern Hemisphere. The most intense rainfalls were recorded at stations in the maritime subtropical zones and the least intense rainfalls in the maritime temperate zones. (Sims-ISWS)
W79-00327

RELATION BETWEEN THE ST. LOUIS URBAN PRECIPITATION ANOMALY AND SYNOPTIC WEATHER FACTORS,
Illinois State Water Survey, Urbana.
J. L. Vogel, and F. A. Huff.
Journal of Applied Meteorology, Vol. 17, No. 8, p 1141-1152, August 1978. 9 fig, 3 tab, 13 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Cities, Weather patterns, Spatial distribution, Effects, Weather, Weather data, Rainfall intensity, Synoptic analysis, Winds, Storms, Movement, Summer, Fronts(Atmospheric), Meteorology, *St. Louis(MO), Synoptic weather types, Precipitation anomalies, Project METROMEX.

The summer (June-August) rainfall distribution on the METROMEX network was analyzed to determine the synoptic conditions during which the urban-industrial regions of St. Louis affect the precipitation process. The rainfall patterns were stratified by direction of movement of convective entities in storm systems, surface wind direction, and basic synoptic weather types. The results provided support for enhancement of rainfall downstorm from the urban-industrial region. Although only 23% of the 330 storms moved from the west-southwest, the storms produced 42% of the network rainfall and were strong contributors to the rainfall anomaly that maximizes 25-30 km northeast of St. Louis. Cold front conditions with the major convective entities moving from the southwest and squall lines with any storm motion were associated with the most intense rainstorms over the raingage network, and these storms were also largely responsible for the rainfall anomaly. The rainfall pattern based on air mass storms did not indicate any significant urban enhancement of rainfall and study of squall zone storms suggested possible reduction of rainfall in the urban region. (Sims-ISWS)
W79-00328

ELECTRIC RAINFALL INTENSITY SENSOR,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
T. E. Battalino, and B. Vonnegut.
Journal of Applied Meteorology, Vol. 17, No. 8, p 1225-1231, August 1978. 8 fig, 2 ref. ONR N00014-71-C-0156, N00014-75-C-0221.

Descriptors: *Rain gages, *Rainfall, *Rainfall intensity, Instrumentation, Equipment, Electrical equipment, Precipitation(Atmospheric), Precipitation intensity, Snowfall, Automation, Measurement, Calibrations, Meteorology.

An instrument having a logarithmic response was described that continuously measures rates of rainfall over the range 0.3-350 mm/h by determining the electrical power required to evaporate the water as it arrives on an exposed sensor. Laboratory calibration experiments illustrated characteristics of the instrument, and field tests showed agreement with a standard tipping-bucket raingage. (Sims-ISWS)
W79-00329

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUNTAINOUS BASIN,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W79-00332

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W79-00339

SIMULATION OF COLD CLOUD PRECIPITATION IN A THREE DIMENSIONAL MESOSCALE MODEL,
National Oceanic and Atmospheric Administration, Boulder, CO. Atmospheric Physics and Chemistry Lab.
C. F. Chappell, and D. R. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 265, Price codes: A03 in paper copy, A01 in microfiche. Technical Report ERL 381-APCL40, October 1976. 30 p, 48 fig, 16 ref, 1 append. Bu. Rec. 14-06-D7676.

Descriptors: *Cloud physics, *Weather forecasting, *Weather modification, *Model studies, Mathematical models, Nucleation, Cloud seeding, Ice, Snow, Precipitation(Atmospheric), Clouds, Rainfall, Forecasting, Equations, Weather, Meteorology.

A cold cloud microphysical model was developed and merged with a 15-level primitive equation mesoscale dynamical model. The microphysical model partitions ice particles into three categories: unrimed, partially rimed, and graupel. Each is considered to have a Marshall-Palmer distribution and is assigned its own set of physical characteristics. Criteria for converting from one ice particle category to another were based on a comparison of accretional to depositional growth rates. Six prognostic equations predict the concentration and mixing ratio for each ice particle category. Processes in the model include deposition, accretion, condensation, evaporation, sublimation, nucleation, and sedimentation. Microphysical processes were coupled back into the dynamical prediction equations so that the effect of ice processes on the air flow could be investigated. The mesoscale model was used to investigate numerically the development and distribution of snowfall over a mountain massif during a 4500-second integration. It appears to simulate realistically the nucleation and growth of ice particles and their transport and sedimentation to the mountain surface. Snowfall distribution, including the leeward extent of precipitation, also appears reasonable and consistent with that observed along the continental divide of Colorado for similar wind regimes. (Sims-ISWS)
W79-00468

RELATIONSHIP OF RAINFALL AND LAKE GROUNDWATER SEEPAGE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W79-00489

POTENTIAL AND LIMITATIONS OF RAINFALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS,
Papua New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W79-00491

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2E.
W79-00492

2C. Snow, Ice, and Frost

ICEBREAKING CAPABILITY OF CCGS 'LABRADOR' IN WESTERN BARROW STRAIT, OCTOBER 23-28, 1973,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
J. D. Bradford.
Manuscript Report Series No. 50, 1978. 13 p, 3 fig, 4 tab, 16 ref.

Descriptors: *Sea ice, *Icebreakers, *Ice cover, *Barrow Strait, Navigation, *Ice loads, McDougall Sound, 'Labrador', Arctic ice, Ice breakup, Ships.

In October 1973, the Canadian government icebreaker CCGS 'Labrador' carried out performance trials in the western Barrow Strait. Progress of the vessel was monitored as it passed through light ice conditions for approximately 320 miles in the Barrow Strait-McDougall Sound area. Ice thickness and pressure were observed whenever possible. Most of the time, the 'Labrador' operated in continuous mode without having to stop, back up, and charge through blocking ice. However, enough resistance was encountered to suggest that in normal years, vessels with the icebreaking capacity of the 'Labrador' would be unable to operate in the Barrow Strait beyond mid-November. Ice conditions from 1962-1973 and ice thickness measurements from 1956 to 1973 are summarized. Also, capacities of several icebreaking vessels in various ice conditions are compared. (Majtenyi-IPA)
W79-00090

FRAZIL ICE FORMATION: A REVIEW,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 14023, p 1239-1255, September 1978. 3 fig, 1 tab, 63 ref, 1 append.

Descriptors: *Frazil ice, *Rivers, *Ice, *Reviews, Crystal growth, Nucleation, Open channels, Turbulent flow, Supercooling, Heat transfer, Theoretical analysis, Water temperature, Crystals, Freezing, Mathematical models, Physical properties, Equations, Crystal growth, Ice jams, On-site investigations, Ice formation.

The problems associated with frazil ice formation were examined; the current state-of-the-art was reviewed; and recommendations for future research were made. No priorities were assigned to these recommendations. Future research should focus on obtaining heat transfer data, temperature measurements, flow measurements, physical measurements on frazil ice crystals (particularly frazil ice concentration), frazil ice nucleation processes, evolution of frazil ice crystals, anchor ice formation, forecasting the occurrence of frazil ice, entrainment of frazil ice crystals in the flow and the resulting two-phase flow, adherence of frazil ice crystals to each other and to objects in the flow, granular growth in pans, flow producing mechanisms in rivers, and the initiation and development of river ice covers from frazil ice. The greatest need is for field measurements and field investigations of the preceding problems during periods of frazil ice formation in rivers. (Humphreys-ISWS)
W79-00120

INLAND ICE SHEET THINNING DUE TO HOLOCENE WARMTH,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy; and Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
I. M. Whillans.
Science, Vol. 201, No. 4360, p 1014-1016, September 15, 1978. 2 fig, 18 ref.

Descriptors: *Ice, *Ice cover, *Recent epoch, *Antarctica, Model studies, Mathematical models, Climatology, Glaciers, Glaciology, Ice sheets, Ice sheet thinning, Warming.

The climatic warming of 10,000 years ago is now affecting the central portions of ice sheets, causing ice-flow acceleration. This process explains the present-day thinning of the ice sheet in West Antarctica. Former ice sheets also must have responded to climatic warming with a delay of thousands of years. This lag in response is important in the climatic interpretation of glacial deposits and of changes in ice volume obtained from deep-sea cores. (Sims-ISWS)
W79-00340

ALLOWING FOR THE WATER PERMEABILITY OF FROZEN GROUND SCREENS DURING THEIR FORMATION,
For primary bibliographic entry see Field 8D.
W79-00467

MIXING IN AN ARCTIC FJORD,
Institute of Ocean Sciences, Sidney (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 2L.
W79-00487

2D. Evaporation and Transpiration

DETERMINATION OF TERRESTRIAL ALBEDO FROM LANDSAT I SATELLITE IMAGERY IN PHOTOGRAPHIC FORM,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 7B.
W79-00012

A NOVEL METHOD OF ESTIMATING THE DISCHARGE OF WATER FROM MOUND SPRINGS OF THE GREAT ARTESIAN BASIN, CENTRAL AUSTRALIA,
South Australia Dept. of Mines, Adelaide.
For primary bibliographic entry see Field 2F.
W79-00112

CHEMICAL INHIBITORS OF PLANT TRANSPIRATION: IV. ACTION OF ALAR-85, (IN FRENCH),
Institut Pasteur, Paris (France).
J. Sivadjian.
Bull Soc Bot Fr 123(3/4), p 107-111, 1976.

Descriptors: *Chemical inhibitors(Plants), *Transpiration, *Plant transpiration, *Alar-85, *Daminozide, Acids, Vicia-Faba.

B-995 or N-dimethylaminosuccinamic acid, is a white powdered substance known as Alar-85 or Daminozide. The transpiration of the leaves of the broad bean (Vicia faba) was significantly decreased if they were treated with a 2% solution of Alar-85 for 4 days. The action was more important at the upper surface of the leaflets than at the lower surface.--Copyright 1978, Biological Abstracts, Inc.
W79-00247

A SIMPLE MODEL FOR SHALLOW LAKE EVAPORATION,
Royal Netherlands Meteorological Inst., De Bilt (Netherlands).
H. A. R. de Bruin.
Journal of Applied Meterology, Vol. 17, No. 8, p 1132-1134, August 1978. 3 fig, 11 ref.

Descriptors: *Evaporation, *Lakes, *Model studies, Energy budget, Latent heat, Foreign countries, Foreign research, Vapor pressure, Meteorological data, Water, Moisture defecit, Equations, *Lake evaporation, *Shallow lake evaporation, *The Netherlands, Empirical model, Penman equation, Saturated surfaces, Saturation vapor pressure.

The empirical model of Priestley and Taylor and the well-known Penman equation were combined to obtain a simple expression for evaporation from a shallow lake. The model was tested for a large lake in The Netherlands with an area of about 460 sq km and an average depth of 3 m. The estimated values of evaporation of 1, 5, 10, and 20 days were compared with energy-budget measurements. The comparison indicated that the proposed model gave good results for periods of 10 days or more. (Roberts-ISWS)
W79-00326

2E. Streamflow and Runoff

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, I. TRACER STUDIES,
New South Wales, Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim, and D. D. Huff.
Journal of Hydrology, Vol. 38, No. 3/4, p 299-318, August 1978. 6 fig, 1 tab, 28 ref.

Descriptors: *Runoff, *Surface runoff, *Subsurface runoff, *Tracers, Radioisotopes, Bromine, Chromium, On-site investigations, Isotope studies, Soil water movement, Spatial distribution, Temporal distribution, Storm runoff, Rainfall, Drainage, Infiltration, Hydrology, Soil water.

Recent studies have demonstrated the occurrence of a variety of storm runoff processes, including those associated with variable source areas. However, there is a need for experimental methods for studying the spatial variability of these processes in the field. One promising method is the use of tracers. When two radiotracers, 51Cr and 82Br, were used in a pilot study of surface and subsurface storm runoff, irregular spatial flow patterns were observed. These patterns were related primarily to the thickness of the surface soil horizon and showed the value of tracers for quantifying horizontal and vertical profiles of flow pathways. Several improvements are possible in measurement techniques and should provide a means for obtaining detailed spatial definition of surface and subsurface storm flow pathways in the field. (See also W79-00116) (Sims-ISWS)
W79-00115

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, II. RUNOFF PROCESSES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim, D. D. Huff, and T. D. Steele.
Journal of Hydrology, Vol. 38, No. 3/4, p 319-341, August 1978. 6 fig, 41 ref.

Descriptors: *Runoff, *Surface runoff, *Subsurface runoff, *On-site investigations, Storm runoff, Rainfall, Soil water, Soil water movement, Sediments, Dissolved solids, Suspended solids, Flow, Hydrographs, Infiltration, Electrical conductance, Water chemistry, Tracers, Isotope studies, Hydrology, Runoff types.

Combined use of radioisotope tracer, flow rate, specific conductance, and suspended-sediment measurements on a large field plot near Stanford, California, has provided more detailed information on surface and subsurface storm runoff processes than woul be possible from any single approach used in isolation. Although the plot was surficially uniform, the runoff processes were shown to be grossly nonuniform, both spatially over the plot, and laterally and vertically within the soil. The three types of processes that have been suggested as sources of storm runoff (Horton-type surface runoff, saturated overland flow, and rapid subsurface throughflow) all occurred on the plot. The nonuniformity of the processes supports the partial- and variable-source area concepts. Subsurface storm runoff occurred in a saturated layer above the subsoil horizon, and short travel times resulted from flow through macropores rather than the soil matrix. Consideration of these observations would be necessary for physically realistic modeling of the storm runoff process. (See also W79-00115) (Sims-ISWS)
W79-00116

STREAM TEMPERATURE ESTIMATION USING KALMAN FILTER,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00121

AN ESTIMATE OF ANNUAL RUNOFF FROM ENGLAND AND WALES, 1728-1976,
Department of the Environment, Reading (England). Water Data Unit.
T. J. Marsh, and I. G. Littlewood.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 131-142, March 1978. 6 fig, 2 tab, 9 ref.

Descriptors: *Runoff, *Discharge(Water), *Annual, Foreign countries, Watersheds(Basins), Model studies, Analysis, Methodology, Statistical methods, Foreign research, *England, *Wales.

One consequence of the 1975-1976 drought was a growing concern about the distribution with respect to time of the available water resources in England and Wales. Various indices of drought have been derived based largely on records of rainfall, but in some cases on studies of the discharge for certain rivers. This paper presented estimates of annual runoff from England and Wales as a whole, from 1728 to 1976. Simple probability analysis showed that annual runoff from England and Wales of the order of 300 mm can be expected, on average, once every 20 years and runoff of 200 mm, on average, once every 125-200 years. Temporal vairations of water-year runoff from England and Wales must still be considered random due to the lack of statistical evidence to suggest otherwise. (Humphreys-ISWS)
W79-00124

LOW-FLOW CHARACTERISTICS OF OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
T. L. Huntzinger.
Open-file report 78-166, March 1978. 93 p, 5 fig, 3 tab, 5 ref.

Descriptors: *Low flow, *Streamflow, *Flow rates, *Oklahoma, Hydrologic data, Base flow, Flow characteristics, Measurement, Sites.

Analysis of streamflow records in Oklahoma show the 2-, 10-, and 20-year low-flow frequency for 1-, 7-, 14-, and 30-day durations for 143 continuous record stations, 46 partial record, and 56 miscellaneous sites. Low-flows of small uncontrolled streams are zero for the State except for northeastern and south-central Oklahoma. (Woodard-USGS)
W79-00257

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE OLYMPIC PENINSULA, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
W. L. Haushild, and D. E. LaFrance.
Open-file report 77-812, 1978. 25 p, 5 fig, 1 plate, 3 tab, 8 ref.

Descriptors: *Low flow, *Streamflow, Base flow, *Streamflow forecasting, *Flow duration, Low-flow frequency, Flow rates, Runoff, *Washington, *Olympic Peninsula(Wash).

Streams in lowland basins of the Olympic Peninsula, Washington, generally have their low flows in summer and peak flows in winter, whereas streams originating at higher elevations in the mountains have their low flows in late summer-early fall and they have both winter and spring peak flows. Data from long-term stations indicate no important trend in low flows during 1940-73 but they do indicate that low flows generally were lower during the relatively dry 1940's than during the relatively wet 1950-73 period. The magnitude and frequency of 7-day low flows were estimated for 116 sites either from frequency analyses of a data at long-term stations or from correlation of data at a short-term station with data at an appropriate long-term station. (Woodard-USGS)
W79-00258

ANALYSIS OF FLOOD RESULTING FROM THE TOCCOA FALLS, GEORGIA, DAM BREAK,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
L. F. Land.
In: Conference on Flash Floods; Hydrometeorological Aspects, May 2-5, 1978, Los Angeles, California: Published by the American Meteorological Society, Boston, Mass., p 127-130, 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Floods, *Dam failure, *Flood data, *Flood discharge, *Peak discharge, Flood frequency, Rainfall, Storm runoff, Georgia, *Toccoa Falls Dam, Comparison analysis, Natural floods.

Hydrologic data are presented for the flood resulting from the Toccoa Falls, Georgia, dam break on November 6, 1977. Magnitudes of the dam-break flood are compared with the magnitudes of the flood that would have been expected from the rainfall had the dam break not occurre. Comparisons are also made with 10- and 100-year flood estimates. The magnitude of the peak discharge directly below the dam break was about 25 times the natural 10-year flood. By the time the flood wave reched a point 7.75 miles downstream, the peak discharge was attenuated so the magnitude was in the range of the 10- to 100-year natural flood.
W79-00262

MODEL OF THE FLOODING CAUSED BY THE FAILURE OF THE LAUREL RUN RESERVOIR DAM, JULY 19-20, 1977, NEAR JOHNSTOWN, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
J. T. Armbruster.
In: Conference on Flash Floods; Hydrometeorological Aspects, May 2-5, 1978, Los Angeles, California: Published by the American Meteorological Society, Boston, Mass., p 190-193, 1978. 1 fig, 5 ref.

Descriptors: *Model studies, *Dam failure, *Floodwater, *Mathematical models, *Flash floods, Synthetic hydrology, Pennsylvania, *Johnstown area, *Laurel Run Reservoir Dam.

On july 19 and 20, 1977, a severe rainstorm caused heavy flooding to many areas near Johnstown, Pennsylvania. This paper is concerned only with the flooding in the Laurel Run basin; much of the flood was caused by the failure of Laurel Run Reservoir Dam. A mathematical model of a breach-induced flood wave was applied to the Laurel Run dam failure. The model estimates wave velocity and height, peak discharges, and other flood-wave characteristics for the reach from the dam to the mouth of Laurel Run, about 2.5 miles. Water-surface elevations simulated by the model are in close agreement with high-water profile data collected in the field.
W79-00263

HIGH-FLOW FREQUENCIES FOR SELECTED STREAMS IN OKLAHOMA,
Geological Survey, Oklahoma City, OK Water Resources Div.
T. L. Huntzinger.
Open-file report 78-161, April 1978. 30 p, 1 fig, 3 tab, 3 ref.

Descriptors: *High flow, *Streamflow, *Oklahoma, *Frequency analysis, *Storm runoff, Floods, Peak discharge, Gaging stations, Flow rates, Flow characteristics, Hydrologic data, Sites.

Streamflow records are analyzed statistically to determine high-flow characteristics of selected streams in Oklahoma. Tables show the 2-, 5-, 10-, 25-, 50-, and 100-year high-flow frequencies for durations of 1, 3, 7, 30, 90, and 365 days. The log-Pearson Type III frequency distribution was used in the computations. Streamflow records used include data extending from 1903 to 1974. (Woodard-USGS)
W79-00273

LONGITUDINAL DISPERSION OF FLUID PARTICLES IN MOUNTAIN STREAMS: I. THEORY AND FIELD EVIDENCE,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W79-00308

LONGITUDINAL DISPERSION OF FLUID PARTICLES IN MOUNTAIN STREAMS: 2. SIMILARITY OF THE MEAN MOTION AND ITS APPLICATION,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W79-00309

THREE-DIMENSIONAL OPEN CHANNEL FLOW,
Pittsburg Univ., PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-00312

FLOOD REGIONS IN JAMAICA,
Calgary Univ., Alberta. Dept. of Geography.
L. C. Nkemdirim, and E. B. Jones.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 63-83, March 1978. 19 fig, 6 tab, 7 ref.

Descriptors: *Floods, *Flood plains, *Regional flood, Streamflow, Rainfall, Drainage, Drainage area, Drainage density, Hydrology, Foreign countries, Islands, Watersheds(Basins), *Flood regions, *Jamaica, *West Indies, Stream frequency, Stream order.

This paper showed that flood potential regions in Jamaica can be derived from data on streamflow, rainfall, and drainage basin characteristics. The probability curves for each region may be used to estimate flood frequency in uncalibrated basins in the region or in sections of streams that are hitherto ungaged. The relationship between the annual average on-day flood flow and the instantaneous annual maximum flood is good enough to enable estimates of the latter to be made when only the former is known. (Lee-ISWS)
W79-00330

SIMULATION OF FLOWS IN UNGAGED BASINS,
Severn-Trent Water Authority, Birmingham (England).
R. E. Manley.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 85-101, March 1978. 5 fig, 6 tab, 11 ref.

Descriptors: *Simulation analysis, *Basins, *Model studies, Streamflow, Hydrology, Mathematical models, Flow, Computer models, Computers, *Ungaged basins, Streamflow simulation, Model calibration.

There are two ways in which a hydrological simulation model can be used to estimate flows in an ungaged basin. The first method, and the only one generally used so far, is to calibrate the model to a similar basin and use the parameter values thus obtained. The second is to use parameters based on measured basin characteristics. Described herein was a model for which most of the parameters are of the second type. This model was applied using mesured basin characteristics to obtain the parameter values and without reference to the gaged flows. The accuracy of the model was good, the correlation coefficient for daily flows being 0.86 and for monthly fows being 0.97. The model was then calibrated to the basin using a version of the Rosenbrock method. Comparison of measured and calibrated parameter values demonstrated the viability of this approach. (Lee-ISWS)
W79-00331

MOMENTUM TRANSFER IN A COMPOUND CHANNEL,
Ulster Coll. Northern Ireland Polytechnic, Jordanstown.
For primary bibliographic entry see Field 8B.
W79-00334

A GENERAL TWO DIMENSIONAL RIVER SIMULATOR,
Waterloo Univ. (Ontario). Dept. of Systems Design.
M. Chandrashekar, L. R. Muir, and T. E. Unny.
In: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, August, 1976, entitled 'Large Engineering Systems'. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, p 473-482, 1977. 5 fig, 2 tab, 4 ref.

Descriptors: *River systems, *Simulation analysis, *Unsteady flow, Estuaries, Computer programs, Algorithms, *Hydrology, Equations, Mathematical models, Systems analysis, Sparse matrix techniques, Finite-difference model.

In recent years, considerable attention has been focussed on the use of implicit finite-difference schemes for solving unsteady flow problems in rivers and estuaries. The major advantage of the implicit method is its unconditional stability for any time or distance steps. The main obstacle in using the method has been the necessity to solve a large system of linearized equations. The algorithm presented herein deals with a two dimensional implicit finite-difference model suitable for the solution of the Navier-Stokes equations; the system of linear equations is solved using sparse matrix techniques. The model has been implemented into a computer program which accepts arbitrary river configurations and different boundary conditions. The model has been applied to a portion of the St. Clair River (which borders the state of Michigan and the province of Ontario). Also, numerical experiments have been carried out on a hypothetical river system. Results are presented. It is concluded that the model has clearly shown the validity and applicability of a two dimensional implicit finite difference scheme for the solution of general river systems. Further work is to be done regarding the effect of changing Manning's n as a function of river bed shape, inclusion of double boundary conditions, and special boundary conditions at the 270 degree corners. (Bell-Cornell)
W79-00397

RIVER TEMPERATURE VARIATION WITH FREEZING AND STORAGE,
Minnesota Univ, Minneapolis. Dept. of Civil and Mineral Engineering; and Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
C. C. S. Song, and K. S. Leung.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Proceedings Paper 14054, Vol. 104, No. EE5, p 879-888, October 1978. 6 fig, 4 ref, 1 append. NSF ENG74-02036.

Descriptors: *Water temperature, *United States, *Rivers, *Model studies, Mathematical models, Stochastic processes, Air temperature, Freezing, Storage, Correlation analysis, Probability, Regression analysis, Water storage, Temperature, Streams, Ice, Thermal properties, Thermal water, Variability.

Water temperature in the northern part of the US is significantly affected by the freezing phenomenon. Because of the freezing constraint on the variability of water temperature, there is a good correlation between the mean value and the fluctuating component. The probability density curve of water temperature variation develops a sharp peak near the freezing point. A stochastic model using two independent variables, air temperature variation, and the mean daily water temperature, was developed. It also was shown that the water temperature variability tends to decrease as a dimensionless reservoir storage capacity decreases. (Sims-ISWS)
W79-00477

SIMPLE SAMPLER ACTIVATION AND RECORDING SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W79-00480

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineers.
D. P. Lettenmaier, and S. J. Burges.
Water Resources Research, Vol. 14, No. 4, p 679-687, August 1978. 17 fig, 1 tab, 25 ref. NSF DEB74-20744-A02.

Descriptors: *Streamflow, *Reservoirs, *Model studies, *Mathematical models, Markoov processes, Monte Carlo method, Flow, Climates, Precipitation(Atmospheric), Runoff, Storage, Time series analysis, Climatology, Hydrology.

Controversy regarding origins of the so-called Hurst phenomenon has continued since the first appearance of Hurst's work. There appear to be at least two general mechanisms which might generate geophysical time series displaying the Hurst phenomenon. The first is nonstationarity of process mean level perhaps owing to dynamic characteristics of the entire earth geophysical system. The second generating mechanism is a stationary model structure such as the Box-Jenkins models with parameters such that substantial low-frequency effects are present. A series of Monte Carlo tests were formed which showed that it will generally be very difficult to distinguish between the two generating mechanisms on the basis of geophysical records of lengths usually available. The Monte Carlo experiments were augmented by analysis of several series of tree ring growth indices ranging in length from 506 to 1,164 years. Analysis of these sequences for nonstationarity in mean level showed that the sequences were entirely compatible with stationary Box-Jenkins models earlier fit to the data by Hipel. However, a similar analysis of the variance of the time series showed that there was evidence nonstationarity in the variances of the records such that the time series were not compatible with the constant variance assumption of the stationary Box-Jenkins models. Finally, sevral reservoir simulations were made by using the sequent peak algorithm for type A (nonstationary mean) and type B (constant mean) models which had been found to be statistically indistinguishable in the Monte Carlo experiments. The results showed that so long as nonstationarity in mean level was modest and demand levels were not too high, the models give very similar results; however, at high demand levels or large non-stationarity in process mean, substantial differences in storage requirements may result. (Sims-ISWS)
W79-00492

2F. Groundwater

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,
Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W79-00003

ELECTRICAL-RESISTIVITY SURVEYS FOR GROUNDWATER IN THE DECCAN TRAP COUNTRY OF SANGLI DISTRICT, MAHARASHTRA,
Geological Survey of India, Hyderabad.
For primary bibliographic entry see Field 4B.
W79-00107

ON THE TWO-DIMENSIONAL GROUND-WATER MOVEMENT,
Thessaloniki Univ., Salonika (Greece). Faculty of Technology.
D. K. Tolikas, A. S. Zorba, and P. D. Latinopoulos.
Journal of Hydrology, Vol. 38, No. 3/4, p 223-230, August 1978. 6 fig, 2 ref.

Descriptors: *Groundwater movement, *Model studies, *Mathematical models, Aquifers, Analytical techniques, Equations, Numerical analysis, Groundwater, Wells, Water wells, Hydrology, Boussinesq equation, Flow fields.

A simple technique to solve the linearized two-dimensional Boussinesq equation in a nonsteady flow field with arbitrary shape was presented. According to this technique, the reservoir boundaries are replaced by small sources emitting attentuating waves. The characteristic content of each source depends on the shape of the flow field. The variation of the free surface at any point of the flow field results from the interaction of all the waves arriving at that point. This technique was applied to a flow field which is confined by rectilinear and

curvilinear boundaries. The results indicated satisfactory proximity to those obtained by numerical analysis. (Sims-ISWS)
W79-00108

POLLUTION OF GROUNDWATER THROUGH NONLINEAR DIFFUSION,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00110

DIGITAL MODEL STUDIES OF UNSTEADY-STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Journal of Hydrology, Vol. 38, No. 3/4, p 249-262, August 1978. 6 fig, 26 ref.

Descriptors: *Groundwater, *Aquifers, *Wells, *Model studies, Mathematical models, Permeability, Specific yield, Drawdown, Storage, Storage capacity, Groundwater movement, Anisotropy, On-site investigations, Test wells, Pumping, Water wells, Hydrology.

A digital model solution was sought for the unsteady-state radial flow to a partially penetrating well pumping at a constant rate from an unconfined anisotropic aquifer. The solution technique used was the iterative alternating-direction implicit method. Attention was focused on the utility of the digital model to analyze aquifer test data in unconfined aquifers so as to evaluate the lateral permeability, vertical permeability, specific storage, and specific yield of the aquifer. That an approximate steady-state solution of flow to partially penetrating wells in unconfined aquifers can be sought also was illustrated. The digital model was applied to analyze field aquifer test data of the time distribution of average drawdown at well screen depths, and of water table drawdown at two radial distances from the test well. (Sims-ISWS)
W79-00111

A NOVEL METHOD OF ESTIMATING THE DISCHARGE OF WATER FROM MOUND SPRINGS OF THE GREAT ARTESIAN BASIN, CENTRAL AUSTRALIA,
South Australia Dept. of Mines, Adelaide.
A. F. Williams, and J. W. Holmes.
Journal of Hydrology, Vol. 38, No. 3/4, p 263-272, August 1978. 5 fig, 7 ref.

Descriptors: *Springs, *Australia, *Discharge(Water), *Measurement, Aerial photographs, Artesian aquifers, Flow, Seepage, Swamps, Streams, Vegetation, Evaporation, Aquifers, Fractures(Geologic), Hydrogeology, *Mound springs.

The discharge of mound springs of northern South Australia was measured by conventional stream-gauging methods during 1974. However, many springs are difficult of access or do not provide well-defined stream courses. Correlation of the measured springs with the area of swamp vegetation which they support showed that the spring water is dissipated by a mean evaporative flux of 6.5 mm/day + or -0.7. Such a measure could be applied to estimate spring discharges wherever aerial photographs suitable for a reliable delineation of the evaporating area of the associated swamps are available. (Sims-ISWS)
W79-00112

USE OF DUMMY VARIABLES IN WATER RESOURCES STUDIES,
Florida Univ., Belle Glade. Inst. for Food and Agricultural Sciences.
For primary bibliographic entry see Field 2G.
W79-00114

KRIGING IN THE HYDROSCIENCES,
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
J. P. Delhomme.
Advances in Water Resources, Vol. 1, No. 5, p 251-266, September 1978. 17 fig, 2 tab, 22 ref.

Descriptors: *Aquifers, *Groundwater, *Model studies, *Mathematical models, Transmissivity, Wells, Water wells, Observation wells, Networks, Network design, Equations, Analytical techniques, Mathematics, Hydrology.

Most of the methods currently used in hydrosciences for interpolation and spatial averaging fail to quantify the accuracy of the estimates. The theory of regionalized variables enables one to point out the relationship between the spatial correlation of hydrometeorological or hydrogeological fields and the precision of interpolation, or determination of average values, over these fields. A new estimation method called kriging has proven to be quite well adapted to solving water resources problems. Presented herein was a series of case studied in automatic contouring, data input for numerical models, estimation of average precipitation over a given catchment area, and measurement network design. (Sims-ISWS)
W79-00134

A NEW FINITE ELEMENT TECHNIQUE FOR THE SOLUTION OF TWO-PHASE FLOW THROUGH POROUS MEDIA,
Princeton Univ., NJ. Dept. of Civil Engineering.
P. S. Huyakorn, and G. F. Pinder.
Advances in Water Resources, Vol. 1, No. 5, p 285-298, September 1978. 18 fig, 18 ref, 1 append.
NSF AER74-01765.

Descriptors: *Groundwater movement, *Porous media, *Model studies, *Finite element analysis, Mathematical models, Analytical techniques, Flow, Groundwater, Numerical analysis, Equations, Hydrology, Weighting functions.

A new upstream weighting finite element technique was developed for improved solution of the two-phase immiscible flow equations. Unlike the upstream weighting technique used by previous investigators, the new technique does not employ finite difference concepts to achieve the required upstream weighting of relative permeabilities or mobilities. Instead, upstream weighting is achieved by (1) representing the relative permeabilities or mobilities as continuous functions expressed in terms of the shape functions and nodal values, and (2) using asymmetric weighting functions to weight the spatial terms in the flow equations. These weihting functions are constructed such that they are dependent on the flow direction along each side of an element. In conjunction with the proposed technique, two solution schemes for treating the resulting set of non-linear algebraic equations were presented. These are the fully-implicit chord slope incremental solution scheme and the Newton-Raphson solution scheme. Both schemes allow the use of large time steps without being unstable. The proposed numerical technique was applied to two problems: (1) the one-dimensional Budkley-Leverett problem, and (2) the two-dimenstional five-spot well flow problem. Results indicated that this technique is superior to not only earlier finite element schemes but also to five-point upstream finite difference formulas. (Sims-ISWS)
W79-00135

TYPE-CURVE ANALYSIS OF TIME-DRAWDOWN DATA FOR PARTIALLY PENETRATING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Ground Water, Vol. 16, No. 5, p 328-333, September-October 1978. 5 fig, 16 ref.

Descriptors: *Curves, *Graphical analysis, *Aquifers, *Water wells, *Drawdown, Analytical techniques, Computer models, Water table aquifers, Anisotropy, Penetration, Permeability, Depth, Specific yeild, Storage coefficient, Model studies, *Partial penetration, *Type curves, Time-drawdown data.

With the aid of a computer, and using an iterative alternating-direction implicit method, a numerical solution was sought for the unsteady-state radial flow to partially penetrating wells pumping at a constant rate from an unconfined anisotropic aquifer. These solutions were used to generate a series of theoretical type curves valid for individual aquifer test situations characterized by particular combinations of two constants C sub 1 = (P sub r/P sub z)(m/r sub w)(m/r sub w) and C sub 2 = (S sub y/S sub s(m)) and particular well penetration. The aquifer test data requirements are the time-drawdown data and at least two pairs of observation wells, one of the pair tapping well-screen depths and the other tapping water table depths. The parameters that were identified are the lateral permeability, vertical permeability, specific storage, and specific yield of the aquifer. The use of the type curves was illustrated by an example. (Visocky-ISWS)
W79-00136

SHORTEST PATH PROBLEMS IN HYDROGEOLOGY,
Food and Agricultural Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 6A.
W79-00137

MAPS SHOWING WATER-LEVEL DECLINES, LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.; and Bureau of Reclamation, Phoenix, AZ. Arizona Dept. of Transportation, Phoenix.
For primary bibliographic entry see Field 7C.
W79-00251

GROUND-WATER DATA, 1974-76, INDIAN WELLS VALLEY, KERN, INYO, AND SAN BERNARDINO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00253

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00256

GROUND-WATER LEVELS IN WYOMING, 1977,
For primary bibliographic entry see Field 7C.
W79-00259

GROUND-WATER AVAILABILITY IN THE HITCHCOCK-RED WILLOW, FRENCHMAN VALLEY, AND MEEKER-DRIFTWOOD IRRIGATION DISTRICTS, SOUTHWEST NEBRASKA,
Geological Survey, Lincoln, NE. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-00260

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF

CUSTER AND FREMONT COUNTIES, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-00274

POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT AND VICINITY, FLORIDA, SEPTEMBER, 1977,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00275

A DIGITAL MODEL OF PART OF THE RIO TEMPISQUE ALLUVIAL AQUIFER, COSTA RICA,
Servicio Nacional de Aguas Subterraneous, San Jose (Costa Rica).
D. Mora-Castro, and J. W. Lloyd.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 73-86, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Computer models, *Alluvial aquifers, *Hydrogeology, Groundwater resources, Groundwater availability, Drawdown, Pumping, Water wells, Transmissivity, Specific yield, Groundwater recharge, Equations, Model studies, Water levels, *Costa Rica, Interference, Well loss, Finite-difference technique.

The hydrogeology of the area was discussed, and the method used in producing a digital model simulation of the alluvial aquifer was described. The availability of groundwater resources in the area is indicated by modelled areal abstractions and drawdown modified by a simple 'worst well' concept of well interference and well loss. Introducing this concept reduces the postulated allowable areal abstraction in the study area by 50%. (Visocky-ISWS)
W79-00311

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUSTRALIA,
Australian Atomic Energy Commission, Lucas Heights, New South Wales (Australia). Isotope Div.
G. E. Calf.
Journal of Hydrology, Vol. 38, No. 3/4, p 343-355, August 1978. 6 fig, 3 tab, 19 ref.

Descriptors: *Geochemistry, *Isotope studies, *Australia, Aquifers, Sampling, Water quality, Carbon radioisotopes, Deuterium, Oxygen isotopes, Wells, Carbonates, Rain, Groundwater recharge, Hydrogeology, Arid climates, Depth, Graphical analysis.

The town of Alice Springs is situated within the arid zone of central Australia and derives its water supply from production bores in Mereenie Sandstone. Twenty-nine samples of this water and other surrounding water have been analyzed for their chemical, radiocarbon, stable carbon, deuterium, and 180 composition to investigate recharge to the quifer system. The measures 14C contents range from 5.1 to 63.4% modern. There is no correlation between borehole depth and percentage modern carbon; however, the samples fall into several groups when the percentage modern carbon is plotted against the reciprocal of the total carbonate content. Within each group, the delta D and delt 180 values are constant and isotopically much lighter than the average annyal rainfall value. It is believed that each group represents a single recharge event, and that recharge to the aquifer system occurred at intervals of a few millennia, when climatic conditions were different from those of today. (Visocky-ISWS)
W79-00322

HYDROGEOCHEMISTRY OF A CALCRETE-CONTAINING AQUIFER NEAR LAKE WAY, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of Mineralogy.
A. W. Mann, and R. L. Deutscher.
Journal of Hydrology, Vol. 38, No. 3/4, p 357-377, August 1978. 7 fig, 2 tab, 29 ref.

Descriptors: *Hydrogeology, *Geochemistry, *Groundwater, *Playas, *Australia, Aquifers, Sampling, Water quality, Carbonates, Equilibrium, Hydrogen ion concentration, Calcite, Dolomite, Gypsum, Mineralogy, Arid climates, Semi-arid climates, Wells, Rain, Weathering, Evaporation, Evapotranspiration, Bicarbonates, Chlorides, Silicates, Clays, *Calcrete, Carbonate equilibria.

Twenty-six water samples from representative sampling locations within a calcrete-containing drainage have been chemically analysed and the results processed to obtain information relevant to the genesis of calcrete. Comparison of major-element concentrations with that of Cl(-) suggests chemical precipitation of Ca(2+), Mg(2+), SO4(2-) and silica within the drainage basin. The HCO3(-) ion concentration is independent of Cl(-) ion concentration (r = 0.30). Groundwater pH appears to be determined by interaction of silica minerals with groundwater and to a lesser extent by carbonate equilibria wherever calcite occurs. Calculated solubility indices give an accurate representation of the distribution of calcite, dolomite, aragonite, silica, gypsum and sepiolite within the drainage basin. Carbonate equilibria appropriate to 25C have been applied to all samples to obtain from the measured HCO3(-) concentration, activities for H2CO3, CO3(2-), and P sub CO2 values-the mean P sub CO2 is 10 to the -2.01 + or - 0.28 power bar. Equilibration of neutral of slightly alkaline groundwaters with this CO2 is responsible for the production of CO3(2-) ion activities of the order of 0.00001 required for precipitation of Ca-Mg carbonate. (Visocky-ISWS)
W79-00323

FORMATION OF A VERMICULITE MINERAL FROM GROUND WATER COMPONENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
For primary bibliographic entry see Field 2K.
W79-00382

HYDROGEOLOGY OF THE GRANDE PRAIRIE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
D. Hackbarth.
Report 76-4, 1977. 17 p, 4 fig, 1 tab, 21 ref.

Descriptors: *Hydrogeology, *Canada, *Groundwater, Geologic mapping, Aquifers, Groundwater movement, Groundwater resources, Water wells, Pumping, Water yield, Transmissivity, Base flow, Geochemistry, Dissolved solids, *Alberta(Canada).

The Grande Prairie map area is located between longitudes 118 deg west and 120 deg west and latitudes 55 deg north and 56 deg north. It covers approximately 6,000 sq mi (15,500 sq km). Precipitation is about 18 in (46 cm) annually, while the potential evapotranspiration is about 19 in (48 cm). Geological units of hydrogeological interest include the surficial deposits, the Wapiti Formation, and the Smoky Group. The latter two are of Late Cretaceous age. The region is divided into two hydrogeological areas: (1) a southern area in which groundwater is abundant, with 20-year safe yields of 25 igpm (2 l/s) common and water of reasonably good quality, and (2) a northern area in which groundwater is not usually available and is of very poor quality. In addition to the 1:250,000 scale groundwater availability map, maps at 1:1,000,000 scale present the hydrochemistry of the surficial deposits and of the bedrock. (Visocky-ISWS)
W79-00470

2G. Water In Soils

EFFECTS OF MUNICIPAL SEWAGE EFFLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5C.
W79-00009

DETERMINATION OF TERRESTRIAL ALBEDO FROM LANDSAT I SATELLITE IMAGERY IN PHOTOGRAPHIC FORM,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 7B.
W79-00012

IRRIGATED SOILS OF THE MILSKAYA PLAIN (IN RUSSIAN),
M. P. Babaev.
Izv Akad Nauk Az Ssr Ser Biol Nauk 3, p 64-68, 1975.

Descriptors: *Irrigated soils, *Milskaya Plain(USSR), *Soils, USSR, Water regime.

In the Miliskaya plain (USSR) under the effect of century-long and intense irrigation there was a change in the water regime (an irrigation-hydromorphic water regime was established in the irrigated soils) in the direction of the soil formation process, and the irrigated soils were enriched with nutrient elements. There is a need for a detailed study of the diagnostic features and refinement of the nomenclature and the development of new methods of survey of irrigated soils.
W79-00060

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET,
Food and Drug Administration, Washington, DC. Div. of Chemistry and Physics.
For primary bibliographic entry see Field 5A.
W79-00080

SOIL, WATER AND AIR SCIENCES RESEARCH.
Science and Education Administration, Washington, DC.
Available from Supt. Doc., U.S. Gov't. Print. Off., as Stock No. 001-007-00902-2. Annual Report, 1978. 270 p, 741 ref.

Descriptors: *Water resources, *Land use, *Soil conservation, *Water conservation, *Natural resources, Irrigation, Drainage, Saline soils, Soil physical properties, Fertility, Environmental effects, Land reclamation, Crops, Revegetation, Erosion control, Solar radiation, Wind energy, Sediment control, Agricultural runoff, Agricultural chemicals, Flood control, Reservoir sedimentation, Cultivation, Air pollution effects, Pesticides, Phytotoxicity, Crop production, Precipitation(Atmospheric), Water pollution, Soil contamination.

Soil, water and air sciences research carried out under nine National Research Programs and one Special Research Program, are briefly described. The programs deal with the following subjects: (1) assessment and reduction of salt damage to crops, soils, and eaters; (2) improvement of irrigation and drainage for more efficient crop production; (3) development of tillage practices for improved crop production, reduced costs and energy consumption, and improved conservation of soil and water;

(4) more efficient use and management of solar and wind energy and precipitation; (5) revegetation and reclamation of land areas disturbed by man; (6) management and conservation of soil fertility for increased production and enhanced nutritional quality of plant and animal products; (7) prevention or reduction of environmental pollution resulting from agricultural or other practices; (8) prediction of water yields, sediment amounts and sources, and agricultural chemical loadings in streams and rivers; (9) control of flooding, reservoir sedimentation, soil erosion, and chemical transport by wind and water. (Majtenyi-IPA)
W79-00105

USE OF DUMMY VARIABLES IN WATER RESOURCES STUDIES,
Florida Univ., Belle Glade. Inst. for Food and Agricultural Sciences.
S. F. Shih, and W. F. P. Shih.
Journal of Hydrology, Vol. 38, No. 3/4, p 289-298, August 1978. 2 fig, 1 tab, 16 ref.

Descriptors: *Water resources, *Land subsidence, *Water levels, *Analytical techniques, *Florida, Agriculture, Crops, Land use, Subsidence, Regression analysis, Soil-water-plant relationships, Statistics, Statistical methods, Soil water, Groundwate, Dummy variables.

Dummy variables 1 and 0 used as an alternative to analyze the variance and convariance to compare the relationship among groups of observations were introduced. Seven-year data of organic soil subsidence in Everglades Agricultural Area related to water table depth and crop were used to demonstrate the techniques of application. Comparisons of the performance of this dummy variable technique with the standard technique were made. The results showed that the dummy variable regression not only can perform a good result as performed by the standard technique, but also can simultaneously test the difference between two regression lines whether due to slope coefficients or to intercept terms. (Sims-ISWS)
W79-00114

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, I. TRACER STUDIES,
New South Wales, Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-00115

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, II. RUNOFF PROCESSES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-00116

RATIONAL DETERMINATION OF UNDERDRAINAGE SYSTEM FROM THE HYDRAULIC POINT OF VIEW: STUDIES ON UNDERDRAINAGE OF CLAYEY PADDY SOIL: III. (IN JAPANESE),
Kyoto Univ. (Japan). Faculty of Agriculture.
Y. Fujioka, and T. Maruyama.
Trans Jap Soc Irrig Drain Reclam Eng. 37, p 33-38, 1971.

Descriptors: Measurement, *Clayey, *Drainage, Equations(Hydraulic), Paddy soils, Soils.

Previously, underdrainage discharge was customarily expressed as standard value of 1 l/s/ha when planning an underdrainage system. This standard measurement is insufficient in an underdrainage system where the soil permeability is very high. The capacity of the underdrainage system must be determined after taking into consideration soil permeability and permissible drainage velocity. An equation was derived showing the relation among underdrainage discharge, water level at the laterals and main drain, and the quantity of storage water at the soil surface by using the relation of the underdrainage discharge and water logged area. This equation was express in finite difference and the calculations were carried out by the relaxiation method. This equation was confirmed by comparison with experimental data obtained for clayey paddy field. As an example of application of this theory, it is possible to carry out rational planning of the underdrainage system which could not be done before with the help of this theory since the equation takes into the consideration solution of problems which arise from the difference in quantity of ponded water at different paddy fields and also the time required for drainage.--Copyright 1974, Biological Abstracts, Inc.
W79-00199

CORRELATION BETWEEN THE SALT CONTENT IN THE HARD PHASE AND SOIL SOLUTIONS OF THE MURGHAB OASIS DESERT-MEADOW SOILS OF ANCIENT IRRIGATION, (IN RUSSIAN),
G. V. Vinogradova.
Probl Osvo Pustyn' 4, p 82-84, 1975.

Descriptors: *Salinity, *Saine soils, Ancient history, Deserts, *Irrigation, Meadows, Murchab, Oasis, Salts, Soils, Turkmen-SSR, USSR.

Comparison of data from analyses of aqueous extracts and soil solutions of Murghab oasis (Turkman SSR, USSR) soils indicated that the extracts and solutions differed significantly in total content of salts and individual ions. This difference was less expressed in the salinized soils, since easily soluble Na SO4 and MgSO4 and NaCl are found in the salts of these soils. In unsalinized soil, where the salts are represented by weakly soluble CaSO4, and calcium bicarbonate, the aqueous extract gave exaggerated indices, converting soil hard-phase components into solution during extraction. The greatest difference between the soil solutions and aqueous extracts was exhibited by HCO3, SO4 and Ca ions, which were greater in the aqueous extracts.--Copyright 1976, Biological Abstracts, Inc.
W79-00203

WATER AND PHYSICAL PROPERTIES OF THE SOD-CALCAREOUS SOILS OF THE CRIMEAN FOOTHILLS (IN RUSSIAN),
L. F. Kaplyuk.
Pochvovedenie 5, p 104-114, 1976.

Descriptors: *Calcareous soils, *Soil physical properties, Sods, Aggregates, Climates, Erosion, Forest, Leaching, Sites, USSR, Vegetation.

A description is given of the microclimate, physical geography, and aggregate properties and water constants of the sod-calcareous soils of the steppe-forest belt on the north slope of the Crimean Mountains (Ukrainian SSR, USSR) formed on the eluvial and eluvial-deluvial limestones, layers of covering gravel and other carbonate deposits. The soils vary in thickness, mechanical composition, degree of storminess, leaching and erosion due to wide variances in soil-forming factors, e.g., the characteristics of the complex mountain relief and plant cover. Highly skeletal and eroded soils exhibit unsatisfactory water and physical properties; more favorable conditions for forest cultures are found in areas with thick, weakly rocky soils or thin soils with small grained (melkozem) or weakly fragmented upper (arable) levels. Eroded, rocky soils containing little melkozem are unsuitable for forest seeding without preparatory improvement.--Copyright 1978, Biological Abstracts, Inc.
W79-00269

A LYSIMETRIC STUDY OF WATERS IN AN IRRIGATED PASTURE (IN RUSSIAN),
Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Meadow Science.
V. A. Tyuldyukov, and A. D. Prudnikov.
Izv Timiryazev S-Kh Adad 5, p 98-107, 1977.

Descriptors: Calcium, Grass, *Leaching, Magnesium, Nitrogen, *Nutrients, Phosphorus, Potassium, *Pastures, *Soil moisture, *Lysimetry, *Podzolic soils.

The effect of different moisture regimes of soddy-podzolic soils on vertical moisture filtration in the 1st meter of soil, pH and chemical composition of lysimetric waters, and leaching of the main mineral elements of grass nutrition were studied on the irrigated cultivated pasture of Moscow (USSR) region by means of lysimeters. Keeping the soil moisture at the 70% level of field capacity in the 0-40 layer cm ensures the lowest water filtration and insignificant leaching of N, P and K from the top meter. The most intensive nutrient leaching, especially of Ca and Mg, from the soddy-podzolic soil occurs in spring and autumn. Excessive moisture results in inefficient water utilization.--Copyright 1978, Biological Abstracts, Inc.
W79-00284

FIELD OBSERVATIONS OF THE MOISTURE REGIME OF A YELLOW-GREY EARTH (OTOKIA SILT LOAM) IN EASTERN OTAGO,
Department of Scientific and Industrial Research, Havelock North (New Zealand). Soil Bureau.
J. P. C. Watt.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 53-72, 1977. 6 fig, 5 tab, 18 ref.

Descriptors: *Soil moisture, *Loam, *On-site data collections, *Moisture blocks, Silts, Moisture content, Moisture tension, Wilting point, soil horizons, Depth, Soil profiles, Gravimetric analysis, Bulk density, *New Zealand, Neutron probe.

The moisture regime of yellow-grey earths has been inferred qualitatively in the past from climate analysis and pedologic interpretation. In this study, quantitative information was obtained. Field measurements, collected over a 3-4 year period, of the moisture tension and moisture content regimes of a model Otokia silt loam (Tokomairiro soil set) site provided data on changes in both moisture status and storage opportunity. The overall regime is characterized by periods of high moisture tension (at or drier than wilting point) in the A and B horizons through summer, and periods of low moisture tension (at or wetter than field capacity) in most horizons in winter. Within the limited range of moisture tensions commanded by resistance block determinations were shown to be compatible. (Visocky-ISWS)
W79-00310

RECLAMATION OF MEADOW-CHERNOZEM SOLONETZES OF THE KUSTANAI OBLAST, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.
A. F. Novikova.
Pochvovedenie (6), p 69-79, 1977.

Descriptors: *Chernozems, *Solonetzer, *Soils, Kustanai Oblast(USSR), Land reclamation, Cultivation.

A characteristic of water-physical, physico-chemical and reclamative properties of meadow-chernozemic low in sodium solonetzes of Kustanai region (USSR) is given. The effect of different practices (tillage, cropping) on changes in physical properties and water regime of developing meadow-chernozemic soils low in sodium solonetzes was studied, and recommendations on their development were given.-Copyright 1978, Biological Abstracts, Inc.
W79-00395

CHANGES IN WATER REGIME OF BROWN FOREST SOILS OF THE GEORGIAN SSR UNDER THE EFFECT OF SILVICULTURAL PRACTICES, (IN RUSSIAN),
Tiflis Inst. of Forestry (USSR).
For primary bibliographic entry see Field 4C.
W79-00401

POSSIBLE USE OF POLYMERIC MATERIALS FOR FORTIFICATION OF DRAINAGE FILLS (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4A.
W79-00439

RELATIONSHIPS AMONG SOME PHYSICAL PROPERTIES OF SOIL (IN SLOVENIAN),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
J. Kosik, and T. Mistina.
Ved Pr Vysk Ustavu Rastlinnej Vyroby Piestanoch (12), p 125-134, 1974.

Descriptors: *Soil physical properties, *Soil moisture, Bean, Birdsfoot, *Capillary water capacity, Red clover, Lucerne, Oats, *Porosity, Sainfoin, Sunflower, Trefoil, *Soil aggregates.

Soil moisture content, reduced specific volume of soil, total porosity, maximum capillary water capacity, coefficient of structure and median wt mean of water stable soil aggregates were investigated. The soils were grown to sainfoin, lucerne, red clover, birdsfoot trefoil, maize, sunflower, broad bean and oats. Correlation analysis was made of the mean values of soil properties under the particular crops to a depth of 40 cm. The coefficient of multiple correlation was significant in the following order: maximum capillary water capacity (0.612-0.763), reduced specific volume (0.815-0.951) and total porosity of soil (0.889-0.961). The coefficient of structure was highly significant under the group of perennial crops (0.578-0.701). Partial correlation coefficients or partial regression coefficients, except for negative correlation between the reduced specific volume and the total porosity of soil, demonstrate a positive relation between the coefficients of structure and the total porosity of soil under legumes. A positive relation was observed between the maximum capillary water capacity and the total porosity (under annual crops) and a negative correlation between the soil moisture content and the coefficient of structure (under sainfoin and birdsfoot trefoil).--Copyright 1978, Biological Abstracts, Inc.
W79-00451

METHODICAL PROBLEMS IN THE EVALUATION AND MAPPING OF EROSION-ENDANGERED LANDS (IN RUSSIAN),
Moscow State Univ. (USSR). Research Lab. of Soil Erosion.
For primary bibliographic entry see Field 2J.
W79-00462

STEADY INFILTRATION FROM SINGLE AND PERIODIC STRIP SOURCES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
V. Batu.
Soil Science Society of America Journal, Vol. 42, No. 4, p 544-549, July-August 1978. 7 fig, 15 ref.

Descriptors: *Infiltration, *Soil water movement, *Theoretical analysis, *Mathematical models, Equations, Sprinkler irrigation, Hydraulic conductivity, Potential flow, Strip sources.

The matric flux potential and horizontal and vertical flux distributions were obtained using Fourier analysis techniques for single and periodic strip sources located on the soil surface. The theory is based on the assumption that the hydraulic conductivity is an exponential function of the soil water potential. The matric flux potential distributions were compared with the results obtained by Warrick and Lomen, who used different mathematical techniques. (Visocky-ISWS)
W79-00471

SOLUTE TRANSPORT DURING ABSORPTION OF WATER BY SOIL: LABORATORY STUDIES AND THEIR PRACTICAL IMPLICATIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and J. R. Philip.
Soil Science Society of America Journal, Vol. 42, No. 4, p 537-544, July-August 1978. 4 fig, 1 tab, 14 ref.

Descriptors: *Infiltration, *Absorption, *Solutes, *Soil water movement, Leaching, Unsaturated flow, Soils, Soil water, Unsteady flow, Capillary action, Dispersion, Laboratory tests, Soil science, Solute transport.

An experimental study of solute transport during absorption into uniform horizontal soil columns was reported. Three pairs of experiments were performed. Each pair had a common initial moisture content (0.04, 0.1, or 0.15), with one experiment involving displacement of concentrated soil solution by dilute solution and the other, vice versa. In all experiments, both the soil solution content and the salt concentration preserved similarity in terms of distance divided by square root of time. This confirmed earlier observations that the longitudinal dispersion coefficient for the conditions of these experiments is effectively independent of volume flux density. The inferred dispersion coefficient was essentially independent also of the volumetric moisture content (at least in the range 0.18-0.28). It was approximately equal to the product of the volumetric moisture content and the molecular diffusivity of KCl in water. The practical implications of the work for field problems were explored, use being made of scaling theory for flow processes involving capillarity and viscous flow. It was concluded that, for the majority of field soils, solute transport during unsaturated flow of any practical duration may be described by a velocity-independent dispersion coefficient. This represents a very great simplification of the formulation, analysis, and prediction of solute transport in such systems. (Sims-ISWS)
W79-00472

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES,
Purdue Univ., Lafayette, IN. Agricultural Experiment Station.
R. G. Stuff, and R. F. Dale.
Soil Science Society of America Journal, Vol. 42, No. 4, p 637-642, July-August 1978. 9 fig, 1 tab, 15 ref.

Descriptors: *Water balance, *Soil moisture, *Water table, *Model studies, *Indiana, Evapotranspiration, Capillary action, Moisture deficit, Moisture stress, Crops, Evaporation pans, Root zone, Corn(Field), Soil moisture extraction, Holding capacity.

Soil moisture balance programs developed on well-drained soils were found to be unsatisfactory for a soil underlain by shallow water tables, a condition typical of about 9 million acres of cropland in Indiana. Capillary rise past a 105-cm root zone boundary was estimated as the difference between estimated evapotranspiration (ET) and changes in soil moisture under corn on a tile-drained Typic Argiaquoll at West Lafayette, Indiana, during 3 growing seasons, 1971-1973. Capillary water was found to supply an average of 27% of the ET in periods with little or no precipitation. Computer model estimates showed capillary water to furnish about 17% of the total ET over a 100-day period from 49 days before silking to 50 days after. The derived relationships with those obtained from literature sources and assumptions regarding runoff and recharge were programmed in a computer model for simulating the daily moisture status and changes in the corn root zone. Model inputs were pan evaporation, precipitation, soil moisture characteristics, corn silking date, and initial soil moisture conditions. The model was found to closely track measurements of both soil moisture and water table depths in 4 independent seasons: early and late plantings in 1970 and 1974. (Visocky-ISWS)
W79-00473

WATER RELATIONS OF FRITTED CLAYS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
C. H. M. van Bavel, R. Lascano, and D. R. Wilson.
Soil Science Society of America Journal, Vol. 42, No. 4, p 657-659, July-August 1978. 3 fig, 6 ref.

Descriptors: *Clays, *Materials, *Plant growth substances, Properties, Hydraulic conductivity, Bulk density, Water content, Drainage, Porous media, Porosity, Soils, Soil properties, Soil water, Materials testing, Soil science, *Fritted clay, Plant-available water.

Experiments and calculations were performed to characterize the water relations of fritted clay, a material which has been found suitable for growing experimental plants. Fritted clay dry bulk density is 0.67 kg/liter, particle density 2.50 kg/liter, total porosity 0.73, and saturated hydraulic conductivity 0.00095 m/sec. The desorption relation was measured, and the unsaturated hydraulic conductivity as a function of water content was calculated. Much water drains from the saturated material by gravity. After drainage from commonly used containers, the material holds 0.31 by volume of plant-available water, and has an air-filled porosity of 0.28. Its water relations are excellent for plant growth purposes. (Sims-ISWS)
W79-00476

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Science and Education Administration, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W79-00484

DENITRIFYING BACTERIA CAN BE ENUMERATED IN NITRITE BROTH,
Connecticut Agricultural Experiment Station, New Haven.
M. G. Volz.
Soil Science Society of America Journal, Vol. 41, NO. 3, p 549-551, May-June 1977. 2 tab, 20 ref.

Descriptors: *Denitrification, *Bacteria, *Nitrites, Laboratory tests.

Denitrifying- and NO3- reducing bacteria in air dry, moist and organic matter amended Yalesville fsl, lake water, and in both effluent and drainage field soil from a septic tank system were enumerated using Difco nutrient broth, which contained either or both NO3- and NO2- and was incubated anaerobically. Most probable numbers (MPN) of denitrifiers were always less than those of NO3- reducers in the same sample, and constituted from 0.02% to 70% of bacteria capable of aerobic growth on yeast extract agar. (Skogerboe-Colorado State)
W79-00498

PROFILE ACCUMULATION OF FERTILIZER-DERIVED NITRATE AND TOTAL NITROGEN RECOVERY IN TWO LONG-TERM NITROGEN-RATE EXPERIMENTS WITH CORN,
Iowa Agricultural and Home Economics Experiment Station, Ames.

V. D. Jolley, and W. H. Pierre.
Soil Science Society of America Journal, Vol. 41, No. 2, p 373-378, March-April 1977. 1 fig, 5 tab, 26 ref.

Descriptors: *Fertilizers, *Fertilization, *Nitrates, Nitrogen, *Corn(Field), *Crop response, Soils, Soil investigations, Soil profiles, Denitrification.

Two long-term N-rate experiments with corn which had been conducted in northwestern Iowa on the Moody and Galva silty clay loam soils for 17 and 15 years, respectively, were studied to determine the recovery of applied N (i) as NO3(-)N at various soil depths, (ii) as organic or fixed N, and (iii) as N removed in the harvested corn gran. The annual N rates applied as NH4NO3 were 0, 56, 112, and 168 kg N/ha on the Moody soil and 0, 90, and 134 kg N/ha on the Galva soil. Nitrogen recovery in the fertilized plots was determined by subtracting the amounts for the unfertilized treatment from those for the fertilized treatments. (Skogerboe-Colorado State)
W79-00500

2H. Lakes

NUTRIENT LOADING/LAKE TROPHIC CONDITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSHING RATE,
Maine Univ. at Orono.
For primary bibliographic entry see Field 5C.
W79-00001

THE EFFECTS OF HEAVY METALS ON ALGAE POPULATIONS IN A SOUTH CENTRAL RESERVOIR,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W79-00011

ECOLOGY OF DREISSENA POLYMORPHA (PALL.) (DREISSENIDAE, BIVALVIA) IN LAKES RECEIVING HEATED WATER DISCHARGES,
Polish Academy of Sciences, Poznan (Poland). Inst. of Applied Zoology.
For primary bibliographic entry see Field 5C.
W79-00068

GENERATION AND PROPAGATION OF DOWNWELLING FRONTS,
Canada Centre for Inland Waters, Burlington (Ontario).
T. J. Simons.
Journal of Physical Oceanography, Vol. 8, No. 4, p 571-581, July 1978. 19 fig, 22 ref.

Descriptors: *Water circulation, *Lake Ontario, *Winds, *Great Lakes, *Model studies, Mathematical models, Lakes, Circulation, Internal waves, Currents(Water), Limnology, Downwelling, Downwelling fronts, Fronts(Water).

The dynamics of downwelling fronts observed along the steep and elongated southern shore of Lake Ontario were investigated by considering the nonlinear response to surface forcing of one-layer and two-layer fluids on a rotating, semi-infinite plane. Analytical and numerical solutions for idealized situations exhibited typical characteristics of the observed fronts such as offshore propagation and periodic recurrence with near-inertial periods. A numerical simulation of an acutal downwelling episode in Lake Ontario showed that this type of model reproduces the observed behavior of the thermocline as well as the associated oscillatory currents. It was concluded that the fronts are to be visualized as internal surges associated with the oscillatory rather than the quasi-geostrophic response of a lake to wind. (Sims-ISWS)
W79-00128

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART I: ONE-DIMENSIONAL GRAVITY WAVE MOTION,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 2L.
W79-00129

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART II: TWO-DIMENSIONAL GRAVITY WAVE MOTION,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 2L.
W79-00130

NUMERICAL COMPUTATION OF THREE-DIMENSIONAL CIRCULATION IN LAKE ERIE: A COMPARISON OF A FREE-SURFACE MODEL AND A RIGID-LID MODEL,
Case Western Reserve Univ., Cleveland, OH.
Y. P. Sheng, W. Lick, R. T. Gedney, and F. B. Molls.
Journal of Physical Oceanography, Vol. 8, No. 4, p 713-727, July 1978. 16 fig, 23 ref.

Descriptors: *Water circulation, *Lake Erie, *Great Lakes, *Model studies, Mathematical models, Computer models, Circulation, Currents(Water), Winds, Seiches, Remote sensing, Satellites(Artificial), Eddies, Flow, Limnology, Free-surface models, Rigid-lid models.

The three-dimensional, time-dependent flow in the Western Basin of Lake Erie has been calculated numerically by means of both a two-mode free-surface model and a rigid-lid model. Detailed comparisons of the results from these two models were presented for two wind conditions: (1) a constant wind suddenly imposed, and (2) an actual wind which is variable in both space and time. For relatively short time intervals, significant differences between the results of the two models occur since the seiche motion was eliminated in the rigid-lid model. Long-term, time-averaged circulation computed by the two models agreed well in periods of strong wind, but differed appreciably in periods of light wind and active seiching. (Sims-ISWS)
W79-00132

SURVIVAL AND OXYGEN CONSUMPTION OF YOUNG KURA CARP UNDER VARIOUS KEEPING CONDITIONS (IN RUSSIAN),
Tsentralnyi Gosudarstvennyi Nauchno-Issledovatelskii Inst. Ozernogo i Rechnogo Rybnogo Khozyaistva, Baku (USSR). Azerbaijan Branch.
T. A. Askerov.
Gidrobiol Zh 11(3), p 76-77, 1975.

Descriptors: *Carp, Kura carp, Larvae, *Oxygen consumption(Carp), *Salinity, Survival, Temperature, Juveniles, Fish hatcheries.

Experiments were carried out on Kura River carp (Cyprinus carpio) to establish the minimum O2 content for survival of the larvae and fry under hatchery conditions, the upper limit of salinity, activity of the fry at different temperatures and salinities and the temperature optimum of the juveniles. Salinity above 4% on larvae and above 6% on fry had an inhibiting effect. Fry at an age of 38 days preferred a water temperature of 27C. O2 consumption per unit time by the fry decreased with decreasing 0 saturation.--Copyright 1976, Biological Abstracts, Inc.
W79-00180

THE PRODUCTIVITY OF A RANGE OF BLANKET BOG VEGETATION TYPES IN THE NORTHERN PENNINES,
Nature Conservancy, Alston (England). Moore House Field Station.
For primary bibliographic entry see Field 2I.
W79-00202

AN INVESTIGATION OF PRIMARY PRODUCTION AND ECOSYSTEM METABOLISM IN A LAKE MICHIGAN DUNE POND,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-00205

WATERHYACINTH (EICHHORNIA CRASSIPES) NUTRIENT UPTAKE AND METABOLISM IN A NORTH CENTRAL FLORIDA MARSH,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-00206

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER DIATOMS,
Cologne Univ. (Germany, F.R.) Botanisches Inst.
For primary bibliographic entry see Field 5C.
W79-00208

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UPTAKE,
New York State Dept. of Health, Albany. Environmental Health Center.
For primary bibliographic entry see Field 5C.
W79-00211

SEASONAL CHANGES IN RESPIRATORY ENZYME ACTIVITY AND PRODUCTIVITY IN LAKE WASHINGTON MICROPLANKTON,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W79-00212

PHYTOPLANKTON EXTRACELLULAR RELEASE AND ITS RELATION TO THE SEASONAL CYCLE OF DISSOLVED ORGANIC CARBON IN A EUTROPHIC LAKE,
State Univ. of New York at Fredonia. Environmental Resources Center.
For primary bibliographic entry see Field 5C.
W79-00213

BENTHIC ALGAE IN A POND AFTER THE ACCUMULATION OF BEET-SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
For primary bibliographic entry see Field 5C.
W79-00216

PHYTOPHILOUS FAUNA IN PONDS FERTILIZED WITH SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
For primary bibliographic entry see Field 5C.
W79-00217

THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL,
Michigan Univ., Ann Arbor. Sea Grant Program.
For primary bibliographic entry see Field 5B.
W79-00249

THE HISTORIC LEVEL OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, UT., Water Resources Div.
T. Arnow, and L. J. Jensen.
In: Desertic Terminal Lakes; Proceedings of the International Conference on Desertic Terminal Lakes, held in Ogden, Utah, May 2-5, 1977, p 73-79, 1977. 6 fig, 4 ref.

Descriptors: *Great Salt Lake, *Utah, *Water level fluctuations, Hydrology, Inflow, Evaporation, Consumptive use, Railroads, Bridges, Effects, Data collections.

The level of Great Salt Lake, Utah, fluctuates continuously in response to climatic changes and tends to maintain an equilibrium between inflow from surface and ground water and precipitation and loss by evaporation. For the period 1847-75, the surface level was computed indirectly; during 1875-1938, the level was measured periodically at staff gages; and since 1938, the level has been measured continuously. During the 130 years of record, the lake has fluctuated over a range of 20 feet. The consumptive use of water as a result of man's activities in the Great Salt Lake drainage basin since 1847 has resulted in a lowering of the lake level by 5 feet. Since 1959, a railroad causeway has separated the lake into two parts. Although the causeway is permeable and is breached by two 15-foot wide box culverts, it has caused a difference in surface level between the two parts of the lake. The maximum recorded difference of level was 2.35 feet in June 1975.
W79-00264

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT,
Versar, Inc., Springfield, VA.
For primary bibliographic entry see Field 5B.
W79-00289

REPORT OF A DEMATIACEOUS HYPHOMYCETE FROM THE GREAT SALT LAKE, UTAH,
Utah State Univ., Logan. Dept. of Biology.
E. A. Cronin, and F. J. Post.
Mycologia, Vol. 59, No. 4, p 846-847, July-August, 1977. 4 fig, 3 ref. OWRT-A-024-UTAH(4), 14-34-0001-6046.

Descriptors: *Halophiles, *Hyphomycetes, *Cladosporium, Utah, Lakes, *Great Salt Lake(Utah).

A hyphomycete was observed from the north arm of the Great Salt Lake,Utah, and identified as a species of Cladosporium. The lake was about 300 g l-1 solids.
W79-00297

A PROCARYOTIC INTRACELLULAR SYMBIONT OF THE GREAT SALT LAKE BRINE SHRIMP ARTEMIA SALINA (L.),
Utah State Univ., Logan. Dept. of Biology.
F. J. Post, and N. N. Youssef.
Canadian Journal of Microbiology, Vol. 23, No. 9, p 1232-1236, 1977. OWRT-A-024-UTAH(5), 14-34-0001-6046.

Descriptors: *Brine shirmp, Symbionts, Halophiles, Utah, Lakes, Great Salt Lake(Utah), Artemia salina, Procarotic symbiont.

Individuals of Artermia salina, the brine shrimp, were captured from the Great Salt Lake, a highly saline (330-340 g l-1 solids content) terminal lake in Utah. Electron microscopy revealed the presence of intracellular procaryotic symbionts in the epithelial lining of the midgut. Fine structure and possible role of the symbiont are discussed.
W79-00298

SEVEN PROBLEMS IN BUBBLE AND JET DROP RESEARCHERS,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 8B.
W79-00319

NUTRITION AND GROWTH OF THE BIGHEAD ARISTICHTHYS NOBILIS (RICH.) IN BODIES OF WATER OF THE DAGESTAN ASSR,
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Makhachkala (USSR). Dagestanskii Div.
L. P. Lazareva, M. O. Omarov, and A. N. Lezina.
Vopr Ikhtiol 17(1): 72-79. 1977 (In Russ. with Russ. summ.)

Descriptors: *Nutrient requirements, *Fish diets, Lakes, Ponds, Zooplankton, Phytoplankton, Aging(Biological), Fry, Diets, Detritus, *Bighead, Russian-SFSR, USSR, Yearlings.

The basic food component of A. nobilis larvae of stages III-IV in ponds and lakes of the Dagestan ASSR (Russian SFSR, USSR) was zooplankton. The role of zooplankton decreased and that of phytoplankton increased as the fish grew older. As a result of poor zooplankton reserves in the studied areas, fingerlings and yearlings were, in the majority of cases, undersupplied with animal food, and sometimes changed over completely to phytoplankton and detritus. The latter comprised 82-99% of the food weight.-Copyright (c) 1978, Biological Abstracts, Inc.
W79-00320

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-00321

A SIMPLE MODEL FOR SHALLOW LAKE EVAPORATION,
Royal Netherlands Meteorological Inst., De Bilt (Netherlands).
For primary bibliographic entry see Field 2D.
W79-00326

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W79-00339

LAKE LEVEL CONTROL AND MANAGEMENT--A CASE STUDY,
Barr Engineering Co., Minneapolis, MN.
For primary bibliographic entry see Field 4A.
W79-00390

OPTIMAL OPERATION OF SHELBYVILLE AND CARLYLE LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W79-00392

ARCADIA LAKE WATER-QUALITY EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W79-00463

HYDRAULICS OF GREAT LAKES INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W79-00469

CONTROL OF WATER RESIDENCE TIME IN SMALL RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 4A.
W79-00482

INTERNAL FRONTS IN TWO-LAYER FLO,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering; and Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics.
For primary bibliographic entry see Field 8B.
W79-00486

RELATIONSHIP OF RAINFALL AND LAKE GROUNDWATER SEEPAGE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W79-00489

2I. Water In Plants

STOMATAL AND NONSTOMATAL REGULATION OF WATER USE IN COTTON, CORN AND SORGHUM,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
R. C. Ackerson, and D. R. Krieg.
Plant Physiology, Vol. 60: p 850-853, 1977. OWRT C-6273(No 5225)(5), 14-31-0001-5225.

Descriptors: *Drought resistance, *Drought tolerance, Moisture availability, *Enzymes, *Moisture stress, *Photosysthesis, *Stomata, Osmotic pressure, Turgidity, Growth stages, *Corn(Field), *Cotton, *Sorghum.

Stomata of corn (Zea mays L.) and sorghum (Sorghum bicolor L.) responded to changes in leaf water potential during the vegetative growth phase. During reproductive growth, leaf resistances were minimal and stomata were no longer sensitive to bulk leaf water status even when leaf water potentials approached -27 bars. Stomata of corn, cotton (Gossypium hirsutum L.), and sorghum appear to respond to changes in the humidity deficit between the leaf and air and in this manner, regulated transpirational flux to some degree. Distinct differences in water transport efficiency were observed in the three species. Under nonlimiting soil water conditions, sorghum exhibited the greatest efficiency of water transport while under limiting soil moisture conditions, cotton appeared most efficient. Corn was the least efficient with respect to non-stomatal regulation of water use. Differences in drought tolerance among the three species are partially dependent on stomatal regulation of water loss, but efficiency of the water transport system may be more related to drought adaptation. This is particularly important since stomata of all three species did not respond to bulk leaf water status during a large portion of the growing season.
W79-00016

WATER RELATIONS AND PHYSIOLOGICAL ACTIVITY OF POTATOES,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
R. C. Ackerson, D. R. Krieg, T. D. Miller, and R. G. Stevens.
Journal of the American Society for Horticultural Science, Vol. 102, No. 5 p 572-575, 1977 4 fig, 1 tab, 17 ref. OWRT C-6273(No 5225)(4).

Descriptors: *Drought resistance, *Drought tolerance, *Moisture availability, *Enzymes, *Moisture stress, *Photosynthesis, *Stomata, Turgidity, Growth stages, *Potatoes.

The effects of varying degrees of water stress on internal water potential components and specific physiological processes were investigated in field grown potatoes. Leaf water potential was not directly related to soil water potential until a specific minimum soil water potential was attained. Subsequently, leaf water potentials did not increase in response to increases in soil water potential. The specific trends in plant water potentials are discussed in relation to the possible involvement of tubers in regulating water flux. Water stress had pronounced effects on physiological processes such as stomatal resistance, photosynthesis and possibly enzyme activity. A decline in leaf water potential was apparently responsible for increased stomatal resistance and decreases in photosynthetic rate. The activities of ribulose di-phosphate carboxylase and phosphoenolpyruvate carboxylase were observed to decrease as leaf water potential declined. The realationship between water stress and physiological processes and the inability of leaf water potentials to respond to increases in soil water potential after a maximum stress may partially explain the extreme sensitivity of potatoes to even mild water stresses.
W79-00017

GROWTH ASPECTS OF GREEN ASH SEEDLINGS IN YEARS VARYING IN MOISTURE (IN RUSSIAN),
Saratov Agricultural Inst. (USSR).
A. I. Peretyatko, and N. I. Fedorov.
Lesovedenie 4, p 75-79, 1975.

Descriptors: *Dry matter, Vegetation, Roots, *Green ash, *Growth rates, *Moisture, Seedlings.

Processes of dry matter accumulation in the whole plant and separate organs are rhythmical. The main part of dry mass accumulates in the 1st half of vegetation. Roots of the 1st order appear at the phase of the 1st pair of true leaves, the 2nd ones at the phase of 2 pairs, the 3rd at 5 pairs, the fourth at 11-13 pairs of leaves. The main part of the seedling root system consists of lateral roots 10-20 and 21-30 mm long.
W79-00018

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, ANNOTATED BIBLIOGRAPHY.
For primary bibliographic entry see Field 10C.
W79-00106

EFFECT OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF CADDIS FLY LARVAE IN SMALL RIVERS (IN RUSSIAN),
Yaroslavskii Gosudarstvennyi Pedagogicheskii Inst. (USSR).
E. F. Nikishina, L. A. Vetrova, T. L. Alekseeva, and G. F. Golubeva.
Ekologiya 5(5), p 40-43, 1974.

Descriptors: *Caddis-fly, Chaetopteryx-villosa, Cyrnus-flavidus, *Distribution, Economus-tenellus, Environmental, Goera-pilosa, Hydropsyche-pellucidula, *Larvae, Limnophilus-flavicornis, Mystrophora-intermedia, Orthotrichia-tetensii, Oxyethira-costalis, Phryganea-grandis, Phryganea-striata, Polycentropus-flavomaculatus, Rhyacophila-nubila, Rhyacophila-septentrionis, Rivers, Silo-pallipes, Soil, USSR.

The distribution of caddisfly larvae was studied in the Rivers Goretovka (Moscow Oblast), Solonitsa (Yaroslavi Oblast), and Kolodnyanka (Smolensk Oblast) (USSR), considering physical and geographic factors. The Goretovka River showed the following ecological groups: psychrophilic rheophilic (Rhyacophila septentrionis, Hydropsyche pellucidula), lithorheophilic (Polycentropus flavomaculatus, Silo pallipes, Goera pilosa, Chaetopteryx villosa), psammorheophilic (Phyganea striata, P. grandis) and pelite-rheophilic (Limnophilus flavicornis). The Solonitsa River shows lithorheophilic Mystrophora intermedia, Ecnomus tennelus and L. flavicornis and phytophilic Oxyethira costalis, E. tennelus, Cyrnus flavidus and Orthotrichia tetensii. The weakly mineralized and hydrocarbonate, Kolodnyanka River showed 12 caddis fly species, of which H. pellucidula, Rhyacophila nubila, and S. pallipes were predominant. Although the Rivers Goretovka and Kolodnyanka belong to different basins, the caddisfly fauna in these 2 rivers was similar. This may be due to similar bottom soil, current speed, and similar chemical composition. The Solonitsa River belongs to the Volga basin, as does the Goretovka. However, the caddisfly fauna composition is different in the 2 rivers. This is due to the unique chemical composition of the water and hydrologic system of the Solonitsa River.
W79-00147

NITRATE REDUCTASE ACTIVITY OF SOYBEANS IN RELATION TO OTHER INDICATORS OF WATER STRESS,
Kansas Water Resources Research Inst., Manhattan.
R. Manam, I. D. Teare, W. L. Powers, and E. L. Skidmore.
Phyton, Vol. 35, No. 2, p 189-194, 1977. 3 fig, 12 ref. OWRT A-060-KAN(2).

Descriptors: Irrigation, *Bioindicators, *Soybeans, Water stress, *Nitrate reductase, Irrigation scheduling.

In vivo nitrate reductase activity (NRA) was monitored in soybeans (Glycine max L. Merr. cv. Calland) and compared to physiological age and to the following physical and physiological indicators of water status in plants and soil: leaf water potential (psi L), stomatal resistance (Rs adaxial), and soil water potential (psi s). NRA was high in vegetative stage, gradually reduced until bloom stage, and then fell rapidly during pod stage onward in non-stressed plants. In stressed plants NRA started falling rapidly early in bloom stage. NRA decreased rapidly when psi leaf decreased below -8 bars but adaxial stomata did not begin to close until psi leaf decreased below -16 bars. Leaf water potential is related to psi soil. NRA decreased when psi soil decreased below -2 bars and adaxial stomata began closing at -7 bars. From these results it is concluded that NRA responded to water stress very early in relation to stomatal resistance and was too sensitive to be used as a tool for irrigation scheduling.
W79-00149

PROGRESS AND PROBLEMS IN THE STUDY OF PLANT-WATER INTERRELATIONS (IN BULGARIAN),
P. Kramer.
Fiziol Rast (Sofia) 2(4), p76-91. 1976.

Descriptors: *Soil-water-plant relationships, *Consumptive use, *Reviews, Model studies, Computer models, Transpiration, Stomata.

Very early studies and studies done at the beginning of the 20th century on plant-water interactions are briefly mentioned, followed by detailed review of more recent contributions in this area. These latter have included progress in the study of water stress measurement, water absorption, the cohesion theory, the concept of a soil-plant-atmosphere unity, modeling and computer simulation, transpiration and stomatal behavior and antitranspirants. Many interesting problems remain to be studied, including root function, resistance to water flow in plants and the soil, the effect of water deficit and drought resistance.--Copyright 1978, Biological Abstracts, Inc.
W79-00187

VEGETATION OF SOUTHEASTERN FLORIDA -- PARTS II - V,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
D. F. Austin, K. Coleman-Marois, and D. R. Richardson.
Florida Scientist, Vol. 40, No. 4, p 331-361, Fall, 1977. 9 fig, 80 ref.

Descriptors: *Florida, *Vegetation, Drainage, Urbanization, Effects, Marshes, Mangroves, Wetlands, Hammocks.

II. Boca Raton Hammock, a tropical hammock on a barrier island, was originally bordered on the west by a freshwater sawgrass marsh which became overgrown by mangrove following drainage. Strand vegetation dominated by saw palmetto has persisted for at least a century. III. Yamota Scrub has undergone few successional changes for the past century despite its near extirpation because of agriculture and urbanization. IV. Butts Hammock is an inland hammock with 73% tropical species. Due to drainage in 1921 and urbanization of this area, all of the wet prairie formerly north of the hammock has disappeared; the majority of the swamps west of the hammock and all of the dry prairies are gone. Most of the hammock itself still remains. V. Boca Raton Inlet has undergone several changes in physiography and vegetation in the past with three major changes in the last 100 years. Increased salinity has resulted in the spread of mangroves, and disturbance has resulted in the establishment of exotic plant species. (Stihler-Mass)
W79-00196

CATTAILS (TYPHA SPP.)--WEED PROBLEM OR POTENTIAL CROP.,
Miami Univ., Coral Gables, FL.
J. F. Morton.
Economic Botany, Vol. 29, No. 1, p 7-29, January-March, 1975. 10 fig, 158 ref.

Descriptors: *Cattails, *Aquatic weeds, *Reviews, Value, *Utilization, Rooted aquatic plants, Foods, Feeds, Construction materials, Wildlife, Pollen, Leaves, Seeds, Oilseed crops, Toxicity, Floss.

Cattails, which are subject to vigorous control measures in many parts of the world, deserve study with respect to industrial utilization as an alternative to destruction. Various uses of cattails reported in the literature are reviewed. Cattail stands provide food and cover for wildlife. They have been cultivated as ornamental plants and to control erosion. As a construction material, cattail stems and leaves have been used to make various objects ranging from sandals to sailboats; the cuticle of the stem has been used for weaving; sheaths cut in the fall have been used to caulk barrels. Fibers can be extracted from leaves and stems. Cattail leaves and stems are suitable for papermaking producing a paper which is rather strong but difficult to bleach. Cattail floss has a wide array of uses including stuffing for cushions and use as an insulating and sound-proofing material. The heart of young plants, rootstocks, rootstock sprouts, flower spikes, pollen and seeds have been used as human and animal foods. Various parts of the plant have been used for medicinal purposes. Cattail seeds yield a drying oil. Cattails have, on various occasions, been reported as toxic to humans and animals. (Stihler-Mass)
W79-00198

EFFECT OF SULFUR DEFICIENCY ON WATER REGIME AND INTENSITY OF PEA AND WHEAT PHOTOSYNTHESIS, (IN RUSSIAN),
Krasnoyarsk State Univ. (USSR).
A. N. Bugakova, E. A. Petrishcheva, and T. E. Il'Yuschchenko.
Fiziol Biokhim Kul't Past 7(5), p 513-516, 1975.

criptors: Droughts, *Pea, *Photosynthesis, stance, *Sulfur, *Wheat, Plant growth.

lants with S deficiency the share of free water eases, the water-holding capacity decreases a 10-20% decrease in the tissue water content lts in a stronger depression of photosynthesis ompared with the plants provided with a higher unt of sulfates. It might be possible to increase plant drought-resistance by increasing the S ply. Copyright 1976, Biological Abstracts, Inc. 9-00200

E PRODUCTIVITY OF A RANGE OF BLAN- T BOG VEGETATION TYPES IN THE RTHERN PENNINES,
ure Conservancy, Alston (England). Moore ise Field Station.
. Forrest, and R. A. H. Smith.
rnal of Ecology, Vol. 63, No. 1, p 173-202, rch, 1975. 9 fig, 13 tab, 16 ref, 1 append.

criptors: *Productivity, *Vegetation, *Bog, sonal, Period of growth, Mosses, Wetlands, luna, Eriophorum, Floristc composition, rthern Pennines.

al and component net production of seven nket bog sites in the Moor House National Na- e Reserve in the northern Pennines, represent- a range of variation in floristic composition, s estimated. There was a two-fold variation in oduction between sites (481-868 g/sq m/yr), the an total annual net production for all seven sites died being 659 + or - 53 g/sq m/yr. Between- ar variation was relatively small in comparison hat between sites--this determined by obtaining ited data from one site over a three-year period. Ie sites with the highest production were those ich had been recently burnt. For the remaining es, assumed to be in a steady state situation, ere was a trend of decreasing production with in- easing wetness, reflecting decreasing contribu- n of Calluna and Eriophorum vaginatum only rtly replaced by increased Sphagnum growth on e wette sites. Mean production per growing ason day for the four Calluneto-Eriophoretum es was 1.98 g m-2 day-1. The total production of e 1215 ha of blanket bog within the Reserve was timated as 7.67 x 10 to the 6th power kg/yr-1. Iaroncelli-Mass)
79-00202

ET MEADOWS IN SOUTHERN SWEDEN: EGETATION, SUCCESSION AND MANAGE- ENT (IN SWEDISH),
und Univ. (Sweden). Dept. of Ecological Botany.
. Larsson.
edd Avd Ekol Bot Lunds Univ (31), p 1-107, 76.

escriptors: *Sweden, *Meadows, Lake shores, Vegetation, Flooding, Water table fluctuation, arex-Acuta, Cattle, Deschampsia-Caespitosa, cology, Filipendula-Ulmaria, Fire, Floristics, rass, Grazing, Hay, Herbs, History, Literature, oils, Waterfowl.

Vet meadows frequently occur along riversides nd lake shores in southern Sweden. They are in- uenced by a high water table or periodic oodings. Physiognomically they are dominated y tall species such as Deschampsia caespitosa, arex acuta or Filipendula ulmaria, though small erbs and grasses are also important components f the vegetation. The general character of the wet eadow varies with soil, water regime and the in- uence of man and cattle, providing different ypes of habitats for waterfowl. The floristic elimitation of these meadows is discussed and a hort account of the historical development is iven. The literature is surveyed. The floristic omposition of the wet-meadow vegetation is sum- arized and ecological species groups are distin- uished using vegetation analyses. The ecological ffects of management (hay-making, grazing, fire) are briefly discussed. Suggestions for the restoration and management of wet meadows are given.--Copyright 1978, Biological Abstracts, Inc.
W79-00288

THE PHOSPHAGENS OF SOME PROTOZOA AS ECOLOGICAL INDICATORS (IN FRENCH),
Cagliari Univ. (Italy). Faculty of Medicine.
For primary bibliographic entry see Field 5A.
W79-00423

2J. Erosion and Sedimentation

MECHANICAL CHARACTERISTICS OF DEBRIS FLOW,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
T. Takahashi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY8, Proceedings Paper 13971, p 1153-1169, August 1978. 12 fig, 9 ref.

Descriptors: *Bed load, *Bores, *Sediments, Fluid mechanics, Velocity, Hydraulics, Sediment transport, Overland flow, Profiles, *Debris flow, Nonstationary bed flow.

A mechanism of occurrence of bore-like debris flow due to the appearance of overland flow on the debris accumulation was considered using the applying shear stress and resisting stress relationship in the bed. The criteria for the occurrence of the nonstationary bed flow and the partly stationary bed flow were made clear. The partly stationary bed flow approaches a quasi-steady state, whose depth, velocity and concentration are predictive applying the concept of dilatant fluid introduced by Bagnold. Although the front height of the nonstationary bed flow increases versus distance, the translation velocity and concentration are nearly constant, and flow characteristics are theoretically predictive by some appropriate assumptions. (Lee-ISWS)
W79-00117

SCOUR OF BED MATERIAL IN VERY ROUGH CHANNELS,
Technical Univ. of Istanbul (Turkey). Dept. of Hydralic and Water Power.
M. Bayazit.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Technical Note, p 1345-1349, September 1978. 3 fig, 2 ref, 1 append.

Descriptors: *Scour, *Laboratory tests, *Bed load, Sediment transport, Channels, Running waters, Movement, Roughness(Hydraulic), Analytical techniques, Analysis, Equations, Rough channels.

Experiments with densely packed uniform spheres have confirmed that the initiation of motion of bed material is affected by the relative roughness of the channel. At shallow depths, larger values of the Shields' parameter are required to initiate the motion. This was explained by the reduction of nondimensional velocities, u/u sub *((velocity of flow in vicinity of particle)/(bed shear velocity)), at the bed level with the increase of d/h((characteristic particle size)/(flow depth)). The effective value of the instantaneous flow velocity is achieved at higher bed shear stresses in comparison with flows at mild slopes. (Humphreys-ISWS)
W79-00122

MEASUREMENTS OF BED LOAD IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 13960, p 291-307, August 1978. 11 fig, 1 tab, 18 ref, 2 append.

Descriptors: *Bed load, *Sediment transport, *Laboratory tests, *Flow, Sedimentation, Analytical techniques, Measurement, Laboratory equipment, Hydraulic models, Movement, Currents(Water), Waves(Water), Beaches, Shore protection, Hydrodynamics, Erosion, Coastal engineering, Testing, Methodology, Oscillatory flow.

Measurements have been made of the quantities of sediment moving as bed load in oscillatory flow over a flat bed. Most of the measurements were made with an oscillating tray in still water, but some were carried out in a wave flume. There was good agreement between the two sets of results. For sand and gravel, the mean sediment transport rate was observed to vary during the course of the cycle like the fourth power of the velocity of oscillation, but with a slight phase lead. For nylon pellets, however, made of the random fluctuations in transport rate, and these were compared with AbouSeida's theoretical model. The agreement was poor for the beds of sand and gravel but reasonable for the nylon pellets. An empirical relationship was derived for the sediment transport rate. (Humphreys-ISWS)
W79-00141

THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL,
Michigan Univ., Ann Arbor. Sea Grant Program.
For primary bibliographic entry see Field 5B.
W79-00249

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00271

NUMERICAL STUDY OF CONTINUOUS SALTATION,
New South Wales Univ., Kensington (Australia). School of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 8B.
W79-00314

BEDFORMS AND THEIR HYDRAULIC STABILITY RELATIONSHIPS IN A TIDAL ENVIRONMENT, BAY OF FUNDY, CANADA,
Oxford Univ., (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W79-00336

METHODICAL PROBLEMS IN THE EVALUATION AND MAPPING OF EROSION-ENDANGERED LANDS (IN RUSSIAN),
Moscow State Univ. (USSR). Research Lab. of Soil Erosion.
M. N. Zaslavskii.
Pochvovedenie (6), p 85-98, 1977.

Descriptors: *Methodology, *Mapping, *Erosion, *Soil erosion, Evaluation, Equations, Fallow fields, *Wischmeier-Smith equation.

Methodical problems in evaluation and mapping of erosion-hazardous lands and the reasons for the use of the Wischmeier-Smith equation are discussed. Methods of using a part of this equation for calculation of possible soil erosion in fallowed fields are described.--Copyright 1978, Biological Abstracts, Inc.
W79-00462

ORIGIN AND TRANSPORT OF LARGE BOULDERS IN MOUNTAIN STREAMS,
Ministry of Works and Development Christchurch (New Zealand). Water and Soil Research.
G. A. Griffiths.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 1-6, 1977. 1 fig, 12 ref.

Descriptors: *Streams, *Mountains, *Boulders, Movement, Scour, Erosion, Rocks, Streamflow, Loads(Forces), Model studies, Mathematical models, Hydrology, Mountain streams, Boulder transport.

The means by which boulders of the order of meters in diameter appear in mountain stream beds was reviewed briefly. It was asserted that downstream translation under the action of direct fluid stress is unlikely. However, a combination of fluid stress and localized scour may effect small near-vertical displacements. Undermining of the stream bank upon which a boulder is perched has the potential to precipitate translation movements several diameters in extent, but the frequency of such incidents is probably not commensurate with the boulder's endurance to size reduction. Therefore, it was supposed that, as a rule, the net translation achieved by a large boulder during a streambed history of ordinary flood events can be measured in tens of meters. Where larger translations are in evidence, this may indicate that catastrophic events, such as natural dam breaks or in-channel debris flows, have occurred. (Sims-ISWS)
W79-00490

DETERMINATION OF SPOIL-BANK EROSION RATES IN OHIO BY USING INTERBANK SEDIMENT ACCUMULATIONS,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
G. D. McKenzie, and J. R. J. Studlick.
Geology, Vol 6, p 499-502, August 1978. 4 fig, 3 tab, 7 ref.

Descriptors: *Spoil banks, *Erosion rates, *Ohio, Sedimentation rates, Weathering, Leaching, Pollutants, Strip mine wastes, Slopes, Vegetation effects, Interbank accumulation, Universal soil-loss equation.

Denudation rates of unvegetated spoil banks in Gallia County, Ohio, were determined using sediment volumes and specific weights in 4 small interbank basins. Calculated rates are higher than those reported from other strip-mined areas because the spoil is unvegetated and consists mainly of friable sandstone. Spoil-bank slopes had erosion rates of 35,000 to 71,000 tons/sq km/yr (metric tons per square km per year) with an equivalent surface degradation of 2.6 to 5.4 cm/yr (cm per year). These rates show good correlation with mean slope length, which ranged from 5.8 to 12.8 m. Rates may be higher than calculated owing to loss of material by chemical weathering and subsequent leaching. The study demonstrated the suitability of simple measurements in interbank depressions to obtain average annual erosion rates for drastically disturbed landscapes. (Visocky-ISWS)
W79-00495

2K. Chemical Processes

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,
Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W79-00003

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5B.
W79-00006

REMOTE WATER MONITORING SYSTEM,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
For primary bibliographic entry see Field 7B.
W79-00047

TRANSFER OF GASES AT NATURAL AIR-WATER INTERFACES,
Pennsylvania State Univ., University Park. Center for Air Environment Studies.
For primary bibliographic entry see Field 2L.
W79-00127

ASBESTOS - A BIBLIOGRAPHY,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W79-00225

YELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969.
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W79-00250

GROUNDWATER QUALITY ATLAS OF NEBRASKA,
Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln.
For primary bibliographic entry see Field 7C.
W79-00252

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI,
Geological Survey, Rollo, MO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00254

AUTOMATED DETERMINATION OF SELENIUM IN WATER,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W79-00261

A LYSIMETRIC STUDY OF WATERS IN AN IRRIGATED PASTURE (IN RUSSIAN),
Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Meadow Science.
For primary bibliographic entry see Field 2G.
W79-00284

MANUAL OF ANALYTICAL QUALITY CONTROL FOR PESTICIDES AND RELATED COMPOUNDS IN HUMAN AND ENVIRONMENTAL SAMPLES,
Lafayette Coll., Easton, PA. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-00287

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUSTRALIA,
Australian Atomic Energy Commission, Lucas Heights, New South Wales (Australia). Isotope Div.
For primary bibliographic entry see Field 2F.
W79-00322

HYDROGEOCHEMISTRY OF A CALCRETE CONTAINING AQUIFER NEAR LAKE WAY WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 2F.
W79-00323

FORMATION OF A VERMICULITE MINERAL FROM GROUND WATER COMPONENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
V. A. Kovda, and A. I. Trubin.
Pochvovedenie (6), p 99-105, 1977.

Descriptors: *Groundwater, *Silicates, Mineralogy, X-ray diffraction, *Vermiculite, Vermiculite formation.

A possibility of vermiculite formation from components of ground water at normal temperature was shown. X-ray diffraction characteristics are presented of the newly-formed mineral.--Copyright 1978, Biological Abstracts, Inc.
W79-00382

ANALYSES OF PAPER MACHINE WATER WITH ION SPECIFIC ELECTRODES. PART IV SULFATE DETERMINATION USING PB(2+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS,
Valmet Oy, Jyvaskyla (Finland).
For primary bibliographic entry see Field 5A.
W79-00429

CHLOROFLUOROCARBONS AS HYDROLOGIC TRACERS A NEW TECHNOLOGY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W79-00461

DENITRIFYING BACTERIA CAN BE ENUMERATED IN NITRITE BROTH,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W79-00498

2L. Estuaries

SIMPLE VENTURI DEVICE FOR MIXING FRESHWATER AND SEAWATER IN AN ESTUARINE CULTURE SYSTEM,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Fisheries Lab.
For primary bibliographic entry see Field 7B.
W79-00071

STUDY OF THE FISHES OF THE LAGOON OF ALVARADO, VERACRUZ, MEXICO (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. di Biologia.
A. Resendez Medina.
Rev Soc Mex Hist Nat 34, p 183-281, 1973.

Descriptors: *Lagoon of Alvarado(Mex), *Dissolved oxygen, *Fishes, Flooding, Freshwater, *Lagoons, *Mexico, Seasonal, Temperature, Veracruz.

Alvarado is a typical coastal lagoon, about 27 km long and 5 km wide, located in the southeastern part of the state of Veracruz, Mexico. It is connected to the Gulf of Mexico by the Papaloapan River. The lagoon is flooded with freshwater during the rainy season, and significant hydrological differences are observed between rainy and dry

sons. The surface-bottom chlorinity gradient raged 8.0% in April, 1966; 0.9% was recorded uly. Surface-bottom dissolved O2 values from ml/l in May to 7.6 ml/l in August. Surface water perature ranged from 34.0C in May-18.1C in . Meristic and morphometric data are provided 311 fishes, representing 60 spp. in 29 families, ected in Laguna de Alvarado. The majority are arine forms present throughout the year but ie marine and freshwater species are also resented. The latter, normally confined to ams and rivers of the drainage basin, enter the una in some numbers during the rainy season. collection includes 56% of the species which commercially important or locally utilized for d.
9-00079

ANSFER OF GASES AT NATURAL AIR-ATER INTERFACES,
nsylvania State Univ., University Park. Center Air Environment Studies.
J. Brtko, and R. L. Kabel.
rnal of Physical Oceanography, Vol. 8, No. 4, p -556, July 1978. 12 fig, 43 ref. EPA R005168, 0397.

scriptors: *Gases, *Air-water interfaces, *Mass nsfer, *Model studies, Mathematical models, mosphere, Sea water, Oceans, Eddies, Laboray tests, Carbon dioxide, Air, Oceanography, ses exchange.

e natural exchange of gases across an air-water erface is an important mechanism that can be antified. The mass-transfer coefficients characizing the liquid phase can be predicted using tain models representing the liquid phase turbuice. Methods were developed to approximate necessary input parameters. Predictions of the dels yielded liquid-phase mass-transfer coeffints well within an order of magnitude of experintal data at air-water interfaces. (Sims-ISWS)
79-00127

OMPARISON OF FINITE-ELEMENT AND NITE-DIFFERENCE SCHEMES. PART I: NE-DIMENSIONAL GRAVITY WAVE MO-ON,
ational Oceanic and Atmospheric Administran, Miami, FL. Atlantic Oceanographic and At-ospheric Labs.
. C. Thacker.
urnal of Physical Oceanography, Vol. 8, No. 4, p 6-679, July 1978. 3 fig, 2 tab, 3 ref.

escriptors: *Mathematical models, *Model stues, *Finite element analysis, *Gravity waves, ater circulation, Equations, Analytical chniques, Seiches, Lakes, Canals, Bays, Mathematics, Limnology, Oceanography, *Finite difrnce analysis.

he finite-element scheme requires more computional expense because it is time-implicit and ecause it requires a smaller time step than the nite-difference scheme. Simulations of normal ode oscillations revealed that for cases where e basin depth and the numerical grid are niform, the finite-difference scheme is more acurate, but for cases where the depth or the grid aries, the finite-element scheme is more accurate. ee also W79-00130) (Sims-ISWS)
79-00129

OMPARISON OF FINITE-ELEMENT AND INITE-DIFFERENCE SCHEMES. PART II: WO-DIMENSIONAL GRAVITY WAVE MO-ION,
ational Oceanic and Atmospheric Administran, Miami, FL. Atlantic Oceanographic and At-ospheric Labs.
. C. Thacker.
urnal of Physical Oceanography, Vol. 8, No. 4, p 80-689, July 1978. 8 fig, 1 tab, 7 ref, 2 append.

Descriptors: *Mathematical models, *Model studies, *Finite element analysis, *Gravity waves, Water circulation, Equations, Analytical techniques, Mathematics, Bays, Estuaries, Shores, Circulation, Oceanography, Limnology, *Finite difference analysis.

Irregular grid finite-difference techniques lead to equations similar to those obtained using finite-element techniques. The simpler finite-difference equations offer the advantage of greater computational economy. The time-implicit, finite-element equations must be inverted at each time step, and the maximum size of the time step is only half that which can be used with the finite-difference equations. Both techniques result in instabilities when used with highly irregular grids, and the finite-element equations are also unstable if the basin is variable. Although the finite-element results are better when compared with finite-difference results from the same grid, comparable finite-difference results can be obtained using a finer grid at less computational expense. (See also W79-00129) (Sims-ISWS)
W79-00130

ON GEOSTROPHIC ADJUSTMENT IN SEA STRAITS AND WIDE ESTUARIES. PART I: ONE-LAYER SYSTEM,
Wisconsin Univ.-Madison. Dept. of Meteorology.
D. Nof.
Journal of Physical Oceanography, Vol. 8, No. 4, p 690-702, July 1978. 8 fig, 17 ref, 1 append. NOAA 04-3-158-61.

Descriptors: *Discharge(Water), *Estuaries, *Straits, *Model studies, Mathematical models, Laboratory tests, Flow, Currents(Water), Water circulation, Coriolis force, Channel flow, Coasts, Tidal waters, Oceans, Oceanography.

The dynamics of outflows from sea straits and wide estuaries were examined through a simplified frictionless model whose primary motions are not constrained to be quasi-geostrophic. The potential vorticity equation was solved by means of approximate analytical methods. Some of the model predictions were tested in the laboratory. The mathematical model predicts that an outflow from a channel with uniform velocity distribution deflects to the right or left, depending on the depth of the basin into which it debouches. There is a 'critical' Rossby number below which the flow separates from one of the basin banks. When a non-uniform velocity is introduced upstream, the direction of deflection may differ substantially from the upstream uniform flow case. The model showed that rotation is important whenever the ratio between the relative depth variation to the Rossby number is not negligible; rotational effects can be important even if the ratio between the channel width and the Rossby deformation radius is entirely negligible. An experimental system consisting of a rotating channel with an abrupt cross sectional variation was used in the laboratory to test the theory. Deflections resulting from 'supercritical' conditions were tested qualitatively with favorable results. (Sims-ISWS)
W79-00131

INERTIAL CURRENTS OVER THE INNER SHELF NEAR 30 DEGREE N,
Louisiana State Univ., Baton Rouge, Coastal Studies Inst.
E. Daddio, W. J. Wiseman, Jr., and S. P. Murray.
Journal of Physical Oceanography, Vol. 8, No. 4, p 728-733, July 1978. 3 fig, 21 ref.

Descriptors: *Currents(Water), *Coasts, *Continental shelf, *Louisiana, *Gulf of Mexico, Model studies, Mathematical models, On-site investigations, Current meters, Tidal waters, Shallow water, Winds, Circulation, Water circulation, Oceanography, Inertial currents, Inner shelf.

Analysis of two month-long current records, one in February and one in May, from the inner shelf (28.9 deg N) west of the Mississippi River delta showed strong oscillations in the diurnal-inertial frequency band. Lack of correlation of these currents with the predicted or measured tide and stron association with frontal passages suggest that they are wind-induced inertial oscillations. The observed oscillations were well reproduced by a time-dependent wind-driven model, including Coriolis acceleration and friction. (Sims-ISWS)
W79-00133

MEASUREMENTS OF BED LOAD IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W79-00141

VEGETATION OF SOUTHEASTERN FLORIDA -- PARTS II - V,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W79-00196

WETLANDS AS A NAVAL ENVIRONMENTAL CONCERN,
Naval Academy, Annapolis, MD. Dept. of Political Science.
For primary bibliographic entry see Field 6G.
W79-00201

THE PHOTOSYNTHETIC AND RESPIRATORY RATES AND TOLERANCES OF BENTHIC ALGAE FROM A MANGROVE AND SALT MARSH ESTUARY: A COMPARATIVE STUDY,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00204

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER DIATOMS,
Cologne Univ. (Germany, F.R.) Botanisches Inst.
For primary bibliographic entry see Field 5C.
W79-00208

DIEL CYCLES OF INORGANIC NITROGEN UPTAKE IN A NATURAL PHYTOPLANKTON POPULATION DOMINATED BY GONYAULAX POLYEDRA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
For primary bibliographic entry see Field 5C.
W79-00210

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UPTAKE,
New York State Dept. of Health, Albany. Environmental Health Center.
For primary bibliographic entry see Field 5C.
W79-00211

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., Trenton, NJ. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00214

THE VERTICAL PLANAR MOTION MECHANISM; A DYNAMIC TEST APPARATUS FOR EVALUATING CURRENT METERS AND OTHER MARINE INSTRUMENTATION,
National Ocean Survey, Rockville, MD.

For primary bibliographic entry see Field 7B.
W79-00224

CONTINUOUS CULTURE OF MARINE DIATOMS UNDER SILICON LIMITATION. 3. A MODEL OF SI-LIMITED DIATOM GROWTH,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-00229

FIRST ECOLOGICAL DATA ON THE OYSTER PONDS IN THE BAY OF BOURGNEUF (IN FRENCH),
Institut des Sciences de la Nature, Nantes (France). Lab. d'Ecologie Animale et Biologie Marine.
J. M. Robert.
Bull Ecol 8(1), p 57-62, 1977.

Descriptors: Bays, *Bay of Bourgneuf(Fr), Hydrogen ion concentration, *Oyster ponds, Ecology, *Oysters, *Diatoms, France, Navicula-ostrearia, *Salinity, *Temperature.

In Bourgneuf bay (France), oysters are immersed in sea basins called oyster ponds, where proliferation of the diatom Navicula ostrearia Bory at the blue pigmented stage leads to the greening. Three ecological factors in a pond (temperature, salinity, pH) were studied together with climatic factors of temperature and rain. The relative isolation of this environment explained diurnal and seasonal fluctuations of the 3 studied factors. A defined diurnal thermic amplitude preceded and signalled the greening phase of the basin; during this period, pH increased and oscillated at about 8.2.--Copyright 1978, Biological Abstracts, Inc.
W79-00295

ANNUAL SUBSURFACE TRANSPORT OF A RED TIDE DINOFLAGELLATE TO ITS BLOOM AREA: WATER CIRCULATION PATTERNS AND ORGANISM DISTRIBUTIONS IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, MD. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore, MD. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00317

OPTICAL CLASSIFICATION OF NATURAL WATERS,
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
R. C. Smith, and K. S. Baker.
Limnology and Oceanography, Vol. 23, No. 2, p 260-267, March 1978. 6 fig, 1 tab, 28 ref. NOAA 04-6-158-44033

Descriptors: *Optical properties, *Sea water, *Oceans, *Classification, Organic matter, Chlorophyll, Phytoplankton, Remote sensing, Light, Light penetration, Attenuation, Color, Oceanography, Marine biology.

A technique was developed that leads to an optical classification of natural waters in terms of the dissolved and suspended biogenous material present. As a first approximation, this classification was made in terms of the total chlorophyll-like pigment concentration. A relationship between the spectral diffuse attenuation coefficient for irradiance and the chlorophyll-like pigment concentration was found with spectral irradiance data for diverse types of ocean waters. The specific spectral attenuation coefficient due to phytoplankton was shown to be consistent with laboratory measurements of the diffuse absorption coefficient of various lot cultures of phytoplankton. (Sims-ISWS)
W79-00318

SEVEN PROBLEMS IN BUBBLE AND JET DROP RESEARCHERS,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 8B.
W79-00319

REGIONAL RESPONSE TO FORCING IN SOUTHERN STRAIT OF GEORGIA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. D. Schumacher, C-A. Pearson, R. L. Charnell, and N. P. Laird.
Estuarine and Coastal Marine Science, Vol. 7, No. 1, p 79-91, July 1978. 10 fig, 1 tab, 14 ref.

Descriptors: *Straits, *Currents(Water), *Tidal effects, *Water circulation, *Canada, Estuaries, On-site investigations, Velocity, Current meters, On-site data collections, Data collections, Surveys, Tidal waters, Water temperature, Winds, Hydrography, Salinity, Convection, *British Columbia, *Strait of Georgia(Canada), Two layered flow.

Current meter, STD, and wind data were presented to describe late winter (February-April) mean circulation in the southern Strait of Georgia. The circulation scheme was dominated by strong outward (southeast) flow on the western side of the strait. On the eastern side there was a weaker northwest flow. Mean speeds within a 95% confidence interval from near-surface (5 m) current records were observed to be 16 + or - 7 cm/s toward the south-southeast in the center of the strait, 26 + or - 5 cm/s toward south-southeast in Boundary Pass, and 3.7 + or - 2.5 cm/s toward the northwest on the eastern side. Oceanic waters enter the region at depth through Haro Strait in response to Fraser River runoff at the surface. Superposition on this flow of strong tidal current signal results in augmentation of the flood on the eastern side of the ebb on the western side; however, there is no net tidal northward flow through Rosario Strait. The wind field during this experiment was generally uniform throughout the region. Although winds were uniform, response was not. The deep waters on the western side have relatively little response to wind, and gravitational convection is the dominant driving mechanism. On the shallow eastern side, wind was concluded to be the dominant mechanism driving mean circulation. (Humphreys-ISWS)
W79-00324

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS,
Harbor Branch Foundation, Inc., Fort Pierce, FL.
For primary bibliographic entry see Field 5A.
W79-00325

BEDFORMS AND THEIR HYDRAULIC STABILITY RELATIONSHIPS IN A TIDAL ENVIRONMENT, BAY OF FUNDY, CANADA,
Oxford Univ., (England). Dept. of Geology and Mineralogy.
R. W. Dalrymple, R. J. Knight, and J. J. Lambiase.
Nature, Vol. 275, No. 5676, p 100-104, September 14, 1978. 4 fig, 2 tab, 35 ref.

Descriptors: *Beds, *Beds under water, *Estuaries, *Canada, Bays, Tidal waters, Tides, Channel morphology, Geomorphology, Sands, Sand waves, Sand bars, Sediments, Erosion, Deposition(Sediments), Particle size, Hydraulics, Water circulation, *Bay of Fundy(Canada), Bedforms.

Three intermediate- to large-scale bed configurations were recognized (from intertidal sand bodies in the Bay of Fundy), each with a discrete hydraulic stability field. Type 1 megaripples ('bars') form at lower flow felocities than Type 2 megaripples ('dunes'), whereas Type 2 megaripples and megarippled sandwaves are separated primarily b grain size. Megarippled sandwaves occur only sands coarser than 0.308 mm. (Sims-ISWS)
W79-00336

VEGETATIVE STABILIZATION OF DREDG SPOIL IN NORTH FLORIDA,
Florida A and M Univ., Tallahassee.
For primary bibliographic entry see Field 5G.
W79-00337

CHANGES IN INTERSTITIAL WATER SALIN TY OF A MISSISSIPPI TIDAL MARSH,
Mississippi State Univ., Mississippi State. Dept. Zoology.
C. T. Hackney, and A. A. De La Cruz.
Estuaries, Vol. 1, No. 3, p 185-188, Septemb 1978. 1 fig, 2 tab, 22 ref. NSF GA-35715.

Descriptors: *Connate water, *Tidal marshe *Mississippi, *On-site investigations, Water qua ty, Marshes, Salinity, Saline water, Marsh plant Data collections, On-site data collection Hydrogen ion concentration, Bays, Surfa waters, Juncus roemerianus, Spartina cynos roides.

The salinity of interstitial water (i.e., the salinity the free soil water) was examined at 11 equidista stations along a transect on a Mississippi tid marsh dominated by Juncus roemerianus a Spartina cynosuroides. Changes in the nearby su face water (e.g., bay water) were reflected in t changes in interstitial water salinity. The salini of interstitial water was usually higher, varyi between 2.5 and 15.8 parts per thousand fro February 1975 through January 1976, than t salinity of the nearby surface water which rang from 0.0 to 11.5 parts per thousand. Following long period of high salinity in the bay and sou (exceeding 14 parts per thousand), the salinity the interstitial water increased to a maximum 16.8 parts per thousand in October. The salinity i creased as the distance of the sampling statio from the source of the flood water increase Mean interstitial water salinity across the mar studied was within 10 parts per thousand, whic did not seem to influence the marsh plant zonatio occurring on the marsh. (Humphreys-ISWS)
W79-00338

A STUDY OF COASTAL POLLUTION AN AGENCY INTERFACE,
University of Southern Mississippi, Hattiesbur Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W79-00389

THE EFFECT OF REDUCED WETLANDS AN STORAGE BASINS ON THE SIZE, STABILIT AND PRODUCTIVITY OF THE WATERSHE MIXING ZONE,
Connecticut Univ., Storrs. Inst. of Wat Resources.
B. L. Welsh.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-288 22 Price codes: A03 in paper copy, A01 in microfich Research Project Technical Completion Repor 1978. 43 p, 9 tab, 18 fig, 22 ref. OWRT A-06 CONN(1). 14-31-0001-5007.

Descriptors: *Estuaries, Management, Urbaniz tion, Watershed management, *Salinity structure Benthic productivity, Stability watershed system *Mixing zones, Freshwater flow, Reduced we lands/storage basins, *Connecticut.

Three watershed systems in southeastern Conne ticut were compared to determine whethe changes in their wetlands and storage basins coul have resulted in an expansion of the estuarine mi ing zone with subsequent losses in benthic produc tivity. In Alewife and Jordan Cove system

astic changes in salinity structure following rain-
orms caused the mixing zone to oscillate over
ly half the total area of the estuary. Beneath this
ne, flocculent silt-clay sediments (80%-85%
ater) covered the bottom in a layer exceeding
ee m in some places. It had been expected that
e Alewife system would be the less stable of the
o, because urban development has destroyed or
nctionally separated 50% of its former water-
urses and inland wetlands and 40% and 75% of
estuarine basins and marshes. It now appears
at both estuaries have exceeded critical
lances, which may be a characteristic of small
tuaries. The Alewife system however, appears
have advanced further on the road to tidal
minance. Its lower reaches are filling rapidly
th marine sediments and its mixing zone may ac-
ally be on the decline. In Goshen Cove, salinity
ructure was very stable following rainstorms,
t the area of soft sediments was expanded
yond the observed limits of mixing. While this
as not anticipated, it appears to be due to
riodic closure of the outlet with Long Island
ound.
W79-00441

IXING IN AN ARCTIC FJORD,
stitute of Ocean Sciences, Sidney (British
olumbia). Frozen Sea Research Group.
. G. Perkin, and E. L. Lewis.
ournal of Physical Oceanography, Vol. 8, No. 5, p
73-880, September 1978. 11 fig, 17 ref.

escriptors: *Fjords, *Arctic, *Mixing, *Canada,
n-site investigations, Bays, Basins, Water circu-
tion, Wave(Water), Internal waves, Shores, Ice,
ea ice, Instrumentation, Water temperature,
alinity, Tides, Energy, Oceanography,
Cambridge Bay(N W T).

leasurements made in Cambridge Bay, N.W.T.,
uring the winter showed that the breaking of in-
rnal waves on the shore influences downward
alt transport from the homogeneous surface layer
roduced by saline convection beneath sea ice
uring growth. Denser water from the shallows,
here the depth of this convective layer is limited
y the sea bed, flows down the slope to the layer
terface contour where the breaking waves in-
roduce turbulence, aiding mixing of the convect-
ng water into the lower layer. Away from the
oundaries, entrainment of salt from the lower to
he upper mixed layer is aided by the internal
aves on the interface. These two salt transports
downward at the boundaries, upward over the
asin) produce horizontal salinity gradients which
verall make water in the shallows less saline than
he surface layer of the basin. The energies availa-
le for these mixing processes were estimated.
Sims-ISWS)
V79-00487

BATHYMETRY AS AN INDICATOR OF NET CIRCULATION IN WELL MIXED ESTUARIES,
South Carolina Univ., Columbia. Dept. of Geolo-
gy; and South Carolina Univ., Columbia. Belle W.
Baruch Inst. for Marine Biology and Coastal
Research.
B. Kjerfve.
Limnology and Oceanography, Vol. 23, No. 4, p
816-821, July 1978. 6 fig, 13 ref. EPA R802928.

Descriptors: *Water circulation, *United States,
*Estuaries, *Bathymetry, Tides, Tidal effects,
Circulation, Coasts, Inlets(Waterways), Salinity,
Sediments, Deposition(Sediments), Erosion,
Scour, Currents(Water), Fathometers, Channels,
Well-mixed estuaries.

In well-mixed, high salinity estuaries of the
southeastern US, the net circulation is mirrored in
the bathymetry. Measurements in North Inlet,
South Carolina, indicated a net current reversal
across the estuary. The cross section bathymetry
is usually bimodal, with two channels separated by
a shallow area. The deeper channel experiences
ebb-directed net flow with ebb-oriented sand
waves as the predominant bedform. In the shal-
lower channel, the net current is flood-directed. In
well-mixed estuaries similar to North Inlet, it may
be possible to determine qualitative circulation
features from a few lateral and longitudinal
bathymetric traces without measurements of cur-
rent velocity and salinity. (Sims-ISWS)
W79-00488

A COMPARISON BY SIZE CLASS AND VOLUME OF DETRITUS VERSUS PHYTOPLANKTON IN CHESAPEAKE BAY,
Chesapeake Biological Lab. Solomons, MD.; and
Maryland Univ., College Park. Department of
Botany.
S. D. Van Valkenburg, J. K. Jones, and D. R.
Heinle.
Estuarine and Coastal Marine Science, Vol. 6, No.
6, p 569-582, June 1978. 3 fig, 7 tab, 26 ref. ERDA
AT-(40-1)-4848.

Descriptors: *Detritus, *Phytoplankton, *Size,
*Volume, *Chesapeake Bay, Sampling, On-site
data collections, On-site investigations, Marine
biology, Plankton, Diatoms, Nannoplankton,
Plankton nets, Data processing, Bays, Estuaries.

Relative numbers and sizes of detritus vs
phytoplankton particles were determined by visual
counting over a period of 17 months at a mid-bay
station in a temperate estuary. Detritus averaged
76.6% of total particle numbers, the phytoplankton
23.4%. Seasonal variation in detritus numbers was
minimal as compared to the strong summer pulse
of the phytoplankton. Detritus numbers were con-
centrated in the smallest size category (64.7% at 2-
5 micrometer) as were the phytoplankton (55.6% at
2.5 micrometer). Detritus particles also
overshadow the phytoplankton in total volume
present, representing 65.7% of total yearly
volume, the remaining 34.3% of total volume
representing live cells. The peak of detritus
volume determined by visual counts is at the high
end (20-35 micrometer), whereas phytoplankton
volume peaks at mid ranges (5-20 micrometer).
Phytoplankton occurrence and abundance, and the
percent of phytoplankton volume contributed by
each taxonomic class, are also recorded. (Sims-
ISWS)
W79-00494

ON GEOSTROPHIC ADJUSTMENT IN SEA STRAITS AND WIDE ESTUARIES: THEORY AND LABORATORY EXPERIMENTS. PART II - TWO-LAYER SYSTEM,
Wisconsin Univ.-Madison. Dept. of Meteorology;
and Wisconsin Univ.-Madison. Marine Studies
Center.
D. Nof.
Journal of Physical Oceanography, Vol. 8, No. 5, p
861-872, September 1978. 6 fig, 11 ref, 1 append.
NOAA 04-3-158-61.

Descriptors: *Flow, *Straits, *Estuaries, *Model
studies, Mathematical models, Hydraulic models,
Laboratory tests, Channels, Channel flow, Fresh-
water, Saline water, Saline water-freshwater inter-
faces, Stratification, Oceans, Oceanography,
Two-layer systems.

A frictionless, nonlinear model with allowance for
motions which are far from a state of geostrophic
balance was considered in order to describe the
dynamics of outflows consisting of two layers of
fluids. The governing equations were solved by
means of perturbation expansions, conformal
mapping, and Fourier series. The theory was com-
pared with laboratory experiments. The model
predicted that an outflow from a channel with
uniform velocity distribution deflects to the right
in the Northern Hemisphere. The parameters of
the problem were combined in such a way as to
show that rotational effects are important when-
ever the ratio between the internal Froude number
to the Rossby number is not negligible; the inverse
of this ratio has a 'critical' value, below which the
flow separates from the left basin bank. The
mathematical analysis showed that an outflow
from a channel with initial negative relative vor-
ticity approximately equal to the Coriolis parame-
ter deflects to the left. As in the uniform flow case,
the flow separates from one of the banks under
certain 'critical' conditions. Two experimental
systems which included an abrupt cross sectional
variation in a rotating channel consisting of two
layers were used. The experimental results com-
pared favorably with the direction of deflection
predicted by the mathematical model. Possible ap-
plication of this study to the Straits of Gibraltar
and other outflows were discussed. (Sims-ISWS)
W79-00497

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

VAPOR COMPRESSION ENERGY REDUCTION BY VERTICAL TUBE FOAM EVAPORATION OF SEAWATER,
California Univ., Berkeley. Sea Water Conversion
Lab.
H. H. Sephton.
In: Proceedings 6th International Symposium
Fresh Water from the Sea, Vol. 2, p. 141-146,
1978.(California Water Resources Center
Desalination Project).

Descriptors: *Vapor compression distillation,
*Desalination, *Desalination plants, Evaporators,
*Distillation, Vertical tube foam evaporation
method, Energy, Sea water, Heat transfer.

Presented are experimental data obtained with a
new vapor compression-driven vertical tube
evaporation pilot plant having a capacity of 20 cu.
meter per day of desalted seawater. Significant
reductions in energy consumption are achievable
for both the upflow and downflow modes of verti-
cal tube evaporation with the vapor compression
technique, by imposing foamy two-phase vapor-
liquid flow over the heat transfer surfaces. This
vertical tube foam evaporation method was shown
to provide heat transfer performance enhance-
ments of 38 and 75 percent for the downflow and
upflow modes respectively, and corresponding
vapor compression energy savings of 14 and 35
percent.
W79-00015

PROCESS FOR THE TREATMENT OF WATER SOLUTION BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West
Germany). (Assignee).
For primary bibliographic entry see Field 5F.
W79-00054

DESALINATION PROCESS USING THERMALLY REGENERABLE RESINS,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
J. H. Barrett, and D. H. Clemens.
U.S. Patent No. 4,087,357, 8 p, 2 tab, 11 ref; Offi-
cial Gazette of the United States Patent Office,
Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Desalination,
*Demineralization, *Water treatment, *Water pu-
rification, Resins, Ion exchange, *Hybrid resins,
Regeneration.

A commercially economical desalination process
employes thermally regenerable resins. The
process utilizes hybrid resins which constitute a
system made up of discrete weak acid and weak
base resin particles. The hybrid resins are
prepared by filling a macroreticular copolymer,
usually termed 'host copolymer' with a cross-

linked copolymer of a different nature termed a 'guest copolymer'. This process results in the location of one type of polymer in the pores and another type of polymer in the framework of the hybrid intermediate polymer. The process includes regenerating the hybrid ion exchange resins by elution with an aqueous liquid having a temperature greater than that of the liquid at the time of the absorption phase. (Sinha-OEIS)
W79-00057

REJECT STREAM REPLACEMENT STUDY.
Bureau of Reclamation, Denver, CO. Lower Colorado Region.
Status report, January 1978. 112 p, 12 fig, 2 tab, 21 ref.

Descriptors: *Desalination, *Reclaimed water, *Mexican Water Treaty, *Colorado River basin, *Water reuse, Canal lining, Ground water mining, Water quality standards, Water resources, Mexico, Gila Project, Saline soils, Desalination plants, International waters, All-American Canal, Salinity, Water quality, Water demand, Pumping, Saline water.

As a result of decreased natural runoff and increased amounts of saline ground water derived from the Gila Project, the salinity of the Colorado River water reaching the Mexican border increased to 1500 p/m in 1962. To comply with the Mexican Water Treaty standard of 800 p/m, the Bureau of Reclamation was authorized to build a desalination plant near Yuma, Arizona, capable of producing 97,000 acre feet of water. However, the highly saline reject stream from this plant would substract 42,000 acre feet of water which must somehow be replaced to supply the amount of water promised to Mexico. Rather than further diminish already minimal water supplies in the Southwest, Congress authorized a study to identify feasible methods to replace the reject stream water. The findings of an interdisciplinary team which examined 11 possible methods from the standpoint of technical, economic, social/environmental, and institutional considerations are summarized. Of these 11 methods, 7 are considered feasible alternatives and will be studied further. These are: lining a reach of the All-American Canal to salvage seepage; desalting sea water from the Pacific near Los Angeles; adding a desalting plant in the Imperial Valley, California; extracting geothermal fluid from the ground and desalting it using heat and pressure of the fluid itself for power; extracting ground water near the U.S. Army Proving Ground near Yuma; pumping ground water seepage flowing southward from the All-American Canal; increasing recovery rate of the Yuma plant from 70% to 90%. Full descriptions of these alternatives as well as the four rejected plans are supplied, including maps, site plans, potential yields, and cost rates. Advantages and disadvantages of each are discussed and compared. (Majtenyi-IPA)
W79-00092

LABORATORY STUDIES ON ADVANCED COMPOSITE H F MODULES FOR SEAWATER REVERSE OSMOSIS,
Albany International Co., Dedham, MA. FRL Div.
M. J. Coplan, R. B. Davis, and J. H. Beale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 990, Price codes: A06 in paper copy, A01 in microfiche. Report OWRT/S--78/14, (1978). 113 p, 21 tab, 46 fig, 13 ref. OWRT S-0089(No. 7508)(1).

Descriptors: *Desalination, *Membrane processes, *Reverse osmosis, Sea water, Brackish water, Membranes, Hollow fiber membrane module, *Composite membranes.

Work conducted under this contract is for the development of a reverse osmosis hollow fiber composite membrane targeted for single-pass seawater desalination. This membrane is comprised of a furan-based rejecting barrier deposited on and near the surface of a microporous polysulfone hollow fiber of dimensions typically 25Ou O. D. and 75u I. D. These dimensions are variable within limits and can be tailored to an application. Porous polysulfone fiber substrate is prepared by a regulated dry jet/wet spinning process. A typical batch preparation will convert a pound of commercial (Union Carbide) polysulfone into approximately 5,000 linear feet of 6-filament continuous yarn spun from a dimethylformamide base spin dope. The rejection barrier is a cross-linked furan resin formed in situ. It is negatively charged due to the existence of numerous sulfonate groups bound to the resin during polymerization, a condition expected to impact fouling resistance. The composite membrane system generally resembles the so-called 'NS-200' type, but significant changes in both form and chemistry have resulted from work carried out independently by the Contractor. Geometry of the fiber bundle and of the module have received much attention. The mechanics of winding and the resulting cross-wound configuration have been designed to minimize channeling and concentration polarization effects. A novel potting and fiber opening process have been perfected.
W79-00300

INCREASED PRODUCT WATER RECOVERY BY REVERSE OSMOSIS USING INTERSTAGE ION EXCHANGE SOFTING AND A SPIRACTOR,
Permutit Co., Inc., Princeton, NJ. Research and Development Center.
A. B. Mindler, and S. T. Bateman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 920, Price codes: A07 in paper copy, A01 in microfiche. Report OWRT/S--78-10, June 20, 1978. 121 p, 13 tab, 20 fig, 11 ref. OWRT S-0124(No 7554)(1).

Descriptors: *Desalination, Scaling, *Desalination processes, *Membrane processes, Reverse osmosis, *Brackish water, *Pilot plants, *Ion exchange, New Mexico, Gypsum scale, Crystal growth, Water treatment, Roswell(NM).

Pilot plant test result are discussed in which 67% increased water recovery was obtained from simulated RO concentrate of high calcium-high sulfate water similar to projected Yuma Desalination Facility reject operated at 70% recovery; i.e. an overall recovery of 90%. The self-sustaining system consisted of ion exchange softening of interstage concentrate using as regenerant salt, only the final reject from Secondary RO and no imported salt. No antiscalant was used for protection of either the IX or RO systems. The level of regeneration was enhanced by reuse of previously used regenerant, desupersaturated with respect to gypsum by a fluidized seed bed crystallizer, a Spiractor. Capital and annual costs are projected. Two RO systems were employed for desalination of the softened concentrate -(a) dupont 4 inch B-10 Polyamide Seawater Hollow Fiber System consisting of three permeators in 2:1 array producing 5400 gpd product water and (b) Envirogenics 498-40 Spiral Wound Cellulose Acetate Blend elements consisting of three two-element vessels in 2:1 array and operated in a partial recycle mode producing 4500 gpd product water. The test work was performed at Roswell Test Facility on chemically 'doctored' blended city and brackish well water over an operating period of 1100 hours and 441 ion exchange cycle, during which the Spiractor removed 2650 lbs. of granular gypsum.
W79-00301

FINAL REPORT ON FIELD TEST EVALUATION AND OPERATION AND MAINTENANCE OF SEAWATER REVERSE OSMOSIS AND ELECTRODIALYSIS PILOT PLANTS AT WRIGHTSVILLE BEACH TEST FACILITY, NOVEMBER 1976,
Kaiser Engineers Oakland, CA.
K. Patel, and F. Harris.
Available from the National Technical Informa
tion Service, Springfield, VA 22161 as PB-287 987
Price codes: A07 in paper copy, A01 in microfiche
Report OWRT/S--78/13, November 1976. 128 p, 3
tab, 35 fig. OWRT 14-30-3175 and 14-34-0001
6512(1).

Descriptors: *Desalination plants, Desalinatio
processes, *Membrane processes, *Reverse os
mosis, *Pilot plants, Pre-treatment(Water), Treat
ment facilities, *Coagulation, Sea water
*Electrodialysis, Thin-Flim Composite Mem
branes, Plugging Index, Dechlorination, Foulin
control, Wrightsville Beach(NC), North Carolina.

Three seawater pretreatment systems, thre
reverse osmosis (RO) membranes and two elec
trodialysis pilot plants were tested at OWRT'
Wrightsville Beach Test Facility between Jul
1975 and August 1976. Pretreatment testing ha
shown that a minimum of 25 mg alum per liter o
seawater was required to obtain settleable flocs i
clarifiers followed by a dual-media and polishin
filtration to obtain 5 minute-and 15 minute
plugging indices less than 30 and 50 respectively
considered by RO manufacturers as indicative o
acceptable feed water quality. Testing of in-lin
coagulation followed by dual-media and polishin
filration indicated an effluent with a 15 minute
plugging index less than 60 and often less than 5
may be obtained with use of only 10 mg/l alum. I
was also found that the use of garnet media in fil
ters greatly improved filtrate quality. The use o
clarifiers provides a consistent prefilt quality o
seawater supply to the filters and smooths out in
fluent quality fluctuations. However, in-lin
coagulation is economically very attractive and it
optimization should provide acceptable feed quali
ty at considerably less cost than the present esti
mates published in literature.
W79-00302

HIGH TEMPERATURE ELCTRODIALYSIS PHASE VI,
Ionics, Inc., Watertown, MA.
F. B. Leitz, H. I. Viklund, and A. D. Jha.
Available from the National Technical Informa
tion Service, Springfield, VA 22161 as PB-288 002
Price codes: A05 in paper copy, A01 in microfiche
Report OWRT/S--78/11, March 1975. 87 p, 6 tab
24 fig, 6 ref. OWRT 14-30-3084(1).

Descriptors: *Desalination, *Electrodialysis
*Membrane processes, Seawater, *Pilot plants
North Carolina, Desalination processes, Cost esti
mate, Wrightsville Beach(NC), Gasket Separators

The overall objective of this program is the development of reliable, improved electrodialysis technology for sea water desalination. The principal improvements are use of thinner components than are currently employed in commercial apparatus and operation at higher than ambient temperature. On the previous phase of Contract No. 14-30-3084, two test stacks and a test rig of flexible application were constructed and shop tested. The present phase of the work has been dedicated to field testing the stacks at the Wrightsville Beach Test Facility. The test rig was designed to contain only one electrodialysis stage. With a single stage, batch operations is required to produce a product of acceptable salinity. To interpret the data from the batch runs, a computer model of the unit was developed. This model was used to simulate the performance under a wide variety of conditions. These simulations with appropriate economic factors were used to calculate the cost of desalting sea water under specified conditions. Under reasonable conditions, the cost of product water ranged from 0.26 to 0.46 $ per cubic meter ($1.00 to $1.75 per thousand gallons). The increase in price over previous estimates is due partly to more accurate knowledge of the system but primarily to increase costs of power and increased costs of components. (See also W76-03148; W74-08070; W74-08069; W74-08068 and W74-08067)
W79-00303

ELOPMENT OF LOW COST MEMBRANE ANING AGENTS,
e (W. R.) and Co., Columbia, MD.
ock.
lable from the National Technical Informa- Service, Springfield, VA 22161 as PB-287 989, e codes: A07 in paper copy, A01 in microfiche. ort OWRT/S--78/12, October 1977. OWRT 14-001-6509(1).

criptors: *Desalination, Scaling, *Desalination esses, *Membrane processes, Reverse osmo- *Brackish wate, *Pilot plants, Electrodialysis, er treatment, Chemical cleaning(Membranes), sum scaling removed, Wellton-Mohawk Ariz.

study included a laboratory phase and a field- phase. In the laboratory phase using either a hetic water or Wellton-Mohawk canal water, es were deposited on cellulose acetate RO nbranes. Cleaning tests were performed with ous chemicals and combinations of chemicals. gypsum scales, a combination of EDTA, am- ium bicarbonate and a fluorocarbon surfac- was found to be more effective than EDTA e, or any other forumlation tested. Ammoni- bifluoride was found to be best for SiO2 es, whereas sodium hydrosulfite was best for -containing scales. Experiments were also run the effectiveness of several commercially ilable scale inhibitors for the inhibition of calci- carbonate and gypsum scales. These results wed that products' marketed by Monsanto and uaness were most effective for the inhibition of cite and gypsum, respectively. The field-test tion of the program showed that the predomi- t scale deposit obtained was a clay-like materi- composed of Si, Al, Ca, Mg and Fe. These osits are extremely difficult to remove and e only partially removed by some of the better forming cleaners tested in the laboratory.
9-00304

3. Water Yield Improvement

ATER HARVESTING FOR AFFORESTA- ON: I. EFFICIENCY AND LIFE SPAN OF PHALT COVER,
search Inst. of Forests and Rangelands, Tehran an).
Mehdizadeh, A. Kowsar, E. Vaziri, and L. ersma.
il Science Society of America Journal, Vol. 42, . 4, p 644-649, July-August 1978. 5 fig, 3 tab, 21 .

scriptors: *Water harvesting, *Impervious mbranes, *Asphalt, *Runoff, Vegetation ablishment, Trees, Arid lands, atersheds(Basins), Forestry, Soils, Foreign untries, Foreign research, Soil sealants, Soil atment, Soil water, Soil moisture, *Iran, Green- lts, Soil water potential.

e water required to irrigate greenbelts being tablished around cities in Iran is a major cause concern in a country with insufficient supplies. ethods of afforestation which do not require ir- ation must be found. One such method is to con- ntrate water, received by a watershed without getation, for distribution over a smaller area here plants are growing by making portions of e watershed area impervious to water through plication of asphalt. This principle was tested on noff plots 2 m wide and 10 m long. Runoff from ch plot was measured to study its variations as a nction of age of asphalt cover and rainfall nount and intensity. The concept was further sted by constructing 2-m wide terraces along ntour lines at 5-m intervals on a hillside with a pe of about 30%. Tree species, ecologically apted to the area, were planted on the terraces. alibrated gypsum blocks were placed at depths of , 30, 45, and 60 cm in the terraces and at depths 10 and 30 cm in the watershed area between the rraces to measure soil water potentials. As the asphalt membrane aged, its efficiency in inducing runoff decreased. The runoff efficiency was nearly 75% initially, but decreased to 25% after 4 years. A regression equation was obtained correlating the runoff efficiency with age of the asphalt membrane. Freezing and thawing of the soil, growth of plants, and shrinking and swelling of clays resulted in the deterioration of the membrane. It remained effective for about 5 years. (See also W77-00475) (Sims-ISWS)
W79-00474

WATER HARVESTING FOR AFFORESTATION: II. SURVIVAL AND GROWTH OF TREES,
Research Inst. of Forests and Rangelands, Tehran (Iran).
A. Kowsar, P. Mehdizadeh, E. Vaziri, and L. Boersma.
Soil Science Society of America Journal, Vol. 42, No. 4, p 650-657, July-August 1978. 2 fig, 9 tab, 17 ref.

Descriptors: *Water harvesting, *Impervious membrane, *Soil-plant-water relationships, *Plant growth, Trees, Runoff, Vegetation establishment, Arid lands, Watersheds(Basins), Forestry, Soil sealants, Soil treatment, Soil water, Foreign countries, Foreign research, Soil moisture, *Iran, Greenbelts.

Alternative methods of afforestation which do not require irrigation must be developed for arid regions. One such method is to concentrate water received by a watershed without vegetation on a smaller area where trees are planted. This can be done by making portions of the surface of a watershed impervious to water through application of asphalt. This principle was tested near Tehran, Iran, by constraining 2-m wide terraces on contour lines at 5-m intervals resulting in a watershed to spreading area ratio of 1.5. Asphalt was sprayed at the rate of 1 liter/sq m in December 1969. Seedlings of Robinia pseudacacia L., Cupressus arizonica G., and Fraxinus rotundifolia Mill., tree species commonly used in irrigated afforestation projects in Iran, were planted in March 1970 on the terraces. Runoff from asphalt-treated areas did not significantly increase the survival of the tree seedlings. The 23.4 mm of rain in July 1970, completely overwhelmed treatment effects. This rain was a rare event for the Tehran area. The increases in growth of height, crown cover, and stem cross section due to the asphalt treatment at the end of a 5-year period were 61.5, 60.9, and 53.0%, respectively, for Robinia pseudacacia L.; 14.6, 15.4, and 31.6%, respectively, for Cupressus arizonica G.; and 29.4, 79.6, and 23.9%, respectively, for Fraxinus rotundifolia Mill. (See also W79-00474) (Sims-ISWS)
W79-00475

3C. Use Of Water Of Impaired Quality

PRELIMINARY IDENTIFICATION OF THE SALT PICK-UP AND TRANSPORT PROCESSES IN THE PRICE RIVER BASIN, UTAH,
Utah Water Research Lab., Logan.
J. P. Riley, D. S. Bowles, D. G. Chadwick, and W. J. Grenney.
Paper presented at the Third International Hydrology Symposium, Fort Collins, Colo. February 1977, 15 p. OWRT-A-039-UTAH(1), 14-34-0001-7094.

Descriptors: Transport depletion, Saline water, *Salinity, *Utah, Salt transport(Rivers), *Price River(Utah).

The Price River is a significant contributor of salt to the Colorado River. Relatively pristine waters leaving the upper elevations of the basin degenerate into highly saline waters entering the Green River. The primary reason for this deterioration is the contact of the river with the Mancos shale, a marine shale, which underlies most of the central basin. The structure of an evolving model of the salt pick-up and transport processes in the Price River Basin is presented. The initial purpose of the model is to aid in the identification of the natural and man-modified hydro-salinity-sediment system of the basin. This identification procedure will result in both a better qualitative understanding of the important physiochemical processes, and in a mathematically precise description of these processes. When the identification stage is complete, the model will be used as a management tool for such purposes as examining various strategies for reducing salt loads in the Price River and in other similar rivers.
W79-00145

DIGGING FOR NEW SOURCES OF ENERGY.
For primary bibliographic entry see Field 8B.
W79-00175

CORRELATION BETWEEN THE SALT CONTENT IN THE HARD PHASE AND SOIL SOLUTIONS OF THE MURGHAB OASIS DESERT-MEADOW SOILS OF ANCIENT IRRIGATION, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W79-00203

IRRIGATION EFFICIENCY, A BIBLIOGRAPHY, VOLUME 3.
Department of the Interior, Washington, D. C., Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.
W79-00307

NUMERICAL STUDY OF CONTINUOUS SALTATION,
New South Wales Univ., Kensington (Australia). School of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 8B.
W79-00314

NATURE AND IMPACT OF RURAL STREAM INPUTS ON WATER QUALITY,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-00483

3D. Conservation In Domestic and Municipal Use

WASOPT USERS MANUAL: AN INTEGER PROGRAMMING METHODOLOGY FOR MUNICIPAL/REGIONAL WATER SUPPLY PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W79-00002

CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.
For primary bibliographic entry see Field 5B.
W79-00005

WATER REUSE AT HIGHWAY REST AREAS: EVALUATION PHASE,
Virginia Highway and Transportation Research Council, Charlottesville.
For primary bibliographic entry see Field 5D.
W79-00087

RELATION BETWEEN THE ST. LOUIS URBAN PRECIPITATION ANOMALY AND SYNOPTIC WEATHER FACTORS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W79-00328

RESIDENTIAL WATER CONSERVATION,
Colorado Univ., Boulder.
V. P. Weakley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 157, Price codes: A11 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 234 p, 14 fig, 37 tab, 5 append. OWRT A-030-COLO(1).

Descriptors: *Cities, *Planning, *Water supply, *Costs, Economics, *Prices, *Conservation, *Demand, *Water conservation, Direct reuse, Water consumption, Water requirements, Cost comparisons, Elasticity of demand, Water rates, Colorado, Denver(Colo), Lyons(Colo).

The feasibility of using various water conservation measures to reduce residential water demand was examined. Ten conservation techniques were found to be relevant. These included meters, recycle systems, devices, pressure and flow reducers, public education, restrictions, building and plumbing codes, horticultural changes and pricing. Each measure was evaluated and various combinations were assessed to develop viable alternative options. Costs and benefits were also evaluated. Water savings of 30 to 40% were possible through imposition of programs of water conservation. A case example of application of such a program for Lyons, Colorado is included.
W79-00440

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES,
Chicago Univ., IL.
For primary bibliographic entry see Field 6D.
W79-00453

FACTORS AFFECTING THE QUALITY OF URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00456

3E. Conservation In Industry

WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.
For primary bibliographic entry see Field 6D.
W79-00007

THE DEVELOPMENT OF THE ELECTRICAL POWER SYSTEM IN THE PACIFIC NORTHWEST, A PUBLIC POLICY PERSPECTIVE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6E.
W79-00143

REGIONAL ELECTRIC ENERGY PLANNING: A CASE STUDY IN THE POLITICS OF SCARCE RESOURCES,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6E.
W79-00144

NEKOOSA CLEANS CONDENSATES WITH STEAM DISTILLATION,
Mo Do Mekan, London(Ontario).
For primary bibliographic entry see Field 5D.
W79-00162

WASTE WATER TREATMENT AND RE-USE WITHIN THE TEXTILE INDUSTRY,
For primary bibliographic entry see Field 5D.
W79-00165

TEXTILE WASTE WATERS: TREATMENT AND ENVIRONMENTAL EFFECTS,
Water Pollution Research Lab., Stevenage (England).
D. K. Gardiner, and B. J. Borne.
Journal of the Society of Dyers and Colourists, Vol. 94, No. 8, p 339-348, August, 1978. 2 fig, 3 tab, 33 ref.

Descriptors: *Textiles, *Dyes, *Bleaching wastes, *Water reuse, *Reclamation, Water pollution sources, Chemical wastes, Organic wastes, Biological treatment, Inorganic compounds, Centrifugation, Activated carbon, Coagulation, Flocculation, Flotation, Dialysis, Adsorption, Tertiary treatment, Oxidation, Membrane processes, Filtration, Separation techniques, Color, Sludge disposal, Treatment facilities, Waste water treatment, Industrial wastes.

The characteristics, treatment, and impact of textile processing effluents are reviewed. Average effluent volumes of 0.18 cu m/kg of cotton or manmade fiber and 416 cu m/day from wool processing are produced; mixed textile wastes contain 264-3070 mg BOD/liter. Final mercerizing, bleaching, and dyeing rinse waters may be sufficiently dilute for reuse; scouring liquors and combined process effluents are generally too highly contaminated for recycling. Secondary treatment of combined domestic wastes and pretreated mill effluent can provide the advantages of nutrient sources, dilution, more convenient sludge treatment, and better treatment supervision. Effluent pretreatment before discharge to a sewer system should include sulfate and hydrogen sulfide removal, volatile solvent removal, and fat and grease reduction. In-plant recovery and reuse can be accomplished by: caustic soda extraction by filtration-dialysis or centrifugation-evaporation; carboxymethylcellulose precipitation by calcium oxide or carbon dioxide; and azo dye stripping by centrifugation and solvent extraction. Dilute rinse waters may be reused after pH adjustment, primary coagulation and flocculation, biochemical or physical-adsorption treatment, or polishing. Color can be removed by: chemical coagulation and separation, bioadsorption and biochemical oxidation, activated carbon adsorption, chemical oxidation, and membrane filtration. Process chemicals, surfactants, foam, and grease can hinder biological treatment; textile sludges may contain high levels of organic compounds, heavy metals, and grease, making disposal or treatment difficult. (Lisk-FIRL)
W79-00166

WATER REUSE: A TRICKLE BECOMES A TORRENT,
J. C. Davis.
Chemical Engineering, Vol. 85, No. 10, p 44, 46, 48, April 24, 1978.

Descriptors: *Water reuse, *Pulp and paper industry, Water conservation, Water pollution sources, Recycling, Chemical industry, Freshwater, Oil industry, Industrial water, Water requirements.

Water reuse practices in the chemical process industries (CPI) are changing. Most companies throughout the U.S.A. are recycling more water and consuming less fresh water, and this pattern is expected to hold through the end of the century. The chemical and allied products, petroleum refining, and pulp and paper spectors of the CPI consume nearly two-thrids (almost 100,000 millio gal/day) of industry requirements. Typica of wate recycling efforts, Scott Paper Co. at Fort Edward New York, has reduced the mill's fresh wate requirements from 10 million to 2.3 millio gal/day. (Witt-IPC)
W79-00400

HOW KIND TO THE RESOURCES IS TH GRINDING PROCESS. (HVOR RESSURSVENN LIG ER SLIPEPROSESSEN),
Norwegian Pulp and Paper Research Inst., Oslo.
J. A. Oksum.
Norsk Skogindustri, Vol. 32, No. 2, p 37-40 February, 1978. 9 fig, 2 ref.

Descriptors: *Water conservation, *Groundwoo mills, Foreign countries, Europe, Energy, Conser vation, Water consumption, Organic matter, Pul and paper industry, Water pollution sources Water pollution control, Water quality control Heat exchangers, Water cooling, Freshwater Temperature, Norway, White water(Pape machines).

A resource utilization study conducted by the Nor wegian Pulp and Paper Research Institute aimed a helping market groundwood mills to improve thei fiber, water, and energy conservation. The im portance of water consumption to losses of soli and dissolved organic matter is pointed out Material balances are calculated and used t prepare energy balances which, in turn, made i possible to estimate the importance of hea exchangers in the white-water circuit. Mills whic cannot cool water with heat exchangers must con sume considerable volumes of freshwater to main tain a satisfactory system temperature. Assumin a constant quality of incoming wood supply, th dissolution of organic matter at constant tempera ture is totally dependent on the energy inpu (measured as pulp freeness). Whether this dis solved material leaves the mill within the produc or with the effluent is governed by the specifi water consumption (per ton of groundwood pulp) Obviously, lowering the freshwater intake will in crease the mill's productivity. (Brown-IPC)
W79-00408

STEAM STRIPPING REDUCES CONDENSATI AT WEYCO MILL,
Weyerhaeuser Co., Springfield, OR.
J. W. Grant.
Paper Trade Journal, Vol. 162, No. 9, p 47, Ma 15, 1978.

Descriptors: *Pulp wastes, *Waste water treat ment, *Condensates, *Steam, Effluents, Pulp an paper industry, Wastes, Industrial wastes, Wast treatment, Biochemical oxygen demand, Oregon Costs, Aerated lagoons, Water pollution treat ment, Water pollution sources, Evaporators Board mills, Kraft mills, Air pollution.

Steam stripping of high-BOD condensate stream from the batch digester blow and relief system, th Kamyr continuous digester flask tank, and th multiple-effect evaporators is practiced at th kraft linerboard mill of Weyerhaeuser Co. i Springfield, Oregon. Vapor recompression pre evaporation ensures the capture of 80% of th BOD, largely in the form of combustible methanol Cost savings resulting from a decrease in BOD discharged to the aeration basin are considerable (Swichtenberg-IPC)
W79-00409

LOOKING AT THE POSITIVE SIDE OF ENER GY REGULATION,
Fraser Companies Ltd., Madawaska, ME.
K. Grotterod.
Pima (Paper Industry Management Association) Magazine, Vol. 60, No. 4, p 15-16, 19, April, 1978 2 illus.

criptors: *Pulp and paper industry, gislation, *Energy, Water conservation, ne, Flow, Industrial water, Water require- ts, Closed systems, Paper machines.

ough government regulations are commonly ved to cause increased capital investments higher operating costs, their positive impact nergy consumption in the pulp and paper in- try cannot be forgotten. At Fraser Companies (Madawaska, Maine), compliance with the n Water Act has reduced water flow and loss ibers and fillers by nearly 45% over a 3-yr od, thereby decreasing the input of virgin raw erials and the energy needed to produce them. sed-cycle water supply to paper machines has served energy by reducing the loss of hot cess water from the system. (Swichtenberg-)
9-00411

W TO UTILIZE STEAM FROM THER- REFINERS. (HUR UTNYTTJA ANGA FRAN RMORAFFINOERER),
lmers Univ. of Technology, Goteborg eden).
arlevang, and T. Johansson.
nsk Papperstidning, Vol. 81, No. 6, p 183-185, il 10, 1978. 2 fig, 1 ref, 3 tab.

scriptors: *Steam, *Thermomechanical pulp- *Energy conservation, Utilization, Pulp and er industry, Electric power production, Heat- Steam turbines, Water conservation, iners(Mechanical).

the manufacture and processing of ther- mechanical pulp, large amounts of steam out 2 tons/ton of thermomechanical pulp) are rated, usually at atmospheric pressure, which be utilized in 3 alternative ways: (1) recom- ssion to increase the steam pressure so as to ize its heat content at elevated temperature; (2) pansion in a condensing turbine to generate chanical or electric energy with which the ener- demand of the refiner can be reduced by about %; and (3) utilization for remote heating of ldings. The first two alternatives gives approxi- tely equal benefits for a 100,000 ton/yr installa- n, although the condensing turbine may offer ght advantages over vapor recompression. The rd possibility is only of subordinate interest. own-IPC)
9-00418

E CLOSED MILL CONCEPT,
ernational Paper Co., Mobile, AL.
W. Bush.
PPI Papermakers Conference, Atlanta, Geor- , April 10-12, 1978. Preprinted Proceedings APPI, Attlanta, Geogia), p 121-124. 13 ref.

scriptors: *Pulp and paper industry, *Water nservation, *Water reuse, Water pollution con- l, Wastes, Industrial wastes, Water pollution rces, Recycling, Legislation, Industrial water, lp wastes, Costs, Economics, Closed systems.

implement a closed mill system, effluent water ich has been sufficiently purified to be suitable dilution or cleaning purposes must be parated from the high-solids concentrate, and rage must be available to accommodate all in- nal fluids from the mill. Advantages of a closed stem include significantly decreased expenses providing and preparing fresh water, decreased atment needs before the release of final ef- ent, and improved public image. Disadvantages lude reduced production (caused by require- nts such as increased addition of retention ls), increased corrosion (caused by increase of solved salts), and other potential problems, ch as excessive temperature build-up, unac- ptable, bacterial growth, product mottle, color riations, pH control, slime, foam, pitch, and felt d wire plugging. There is also a strong phychological resistance to the closed mill system. Examples of closures at 3 mills are discussed. One of the major complaints against the closed mill concept involves federal regulations: because of time limitations, imposed expenditures are mandated, and the rate of spending is uncontrolled. (DuVall-IPC)
W79-00420

3F. Conservation In Agriculture

STOMATAL AND NONSTOMATAL REGULATION OF WATER USE IN COTTON, CORN AND SORGHUM,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W79-00016

WATER RELATIONS AND PHYSIOLOGICAL ACTIVITY OF POTATOES,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W79-00017

ANGULARITY SENSOR MEANS FOR CENTER PIVOT IRRIGATION SYSTEM,
Toro Co., San Marcos, CA. (Assignee).
E. J. Hunter.
U.S. Patent No. 4,085,771, 7 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1306, April 25, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Application equipment, Lateral conveyance structures, Water delivery, Sensors.

A center pivot irrigation system has propelled articulated span units mounting interconnected sections of water carrying conduit. Each span unit has a motor and a motor control for regulating the operation of the system to maintain the span units in a pre-determined relative alignment in a vertical plane revolving about a vertical line at the center pivot of the system. The control has an angularity sensor which is connected between span units for sensing in a substantially horizontal plane changes in angularity between the span units relative to the desired revolving vertical plane. (Sinha-OEIS)
W79-00023

FLOW REDUCING DEVICES PARTICULARLY USEFUL AS DRIP EMITTERS FOR DRIP IRRIGATION,
M. Drori.
U.S. Patent No. 4,084,749, 7 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 962, April 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, Application equipment, Water delivery, Drip irrigation.

Flow-reducing devices particularly useful as drip emitters comprise a housing having a closure cap snap-fitted and enclosing a flow-retarding member formed with recesses on opposite faces. Each recess is bridged by a pair of holes to provide a serial path for the flow of the water through the holes from one face to the opposite face. Also described is the use of a regulator including a valve member sensing the fluid pressure at the inlet of the device to produce a substantially uniform output of water despite variations in the line pressure at the inlet. (Sinha-OEIS)
W79-00031

TWO-STEP ROLL AHEAD IRRIGATION SYSTEM,
R. D. Boone, and C. Griffin.
U.S. Patent No. 4,084,610, 8 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 912, April 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Application equipment, Operation and maintenance.

An irrigation system is moved with an oscillating trojan bar operating against a lugged wheel. A drive pawl on the trojan bar drives the wheel forward on level ground or uphill. A hold-back pawl on the trojan bar keeps the wheel from running free when going downhill. The detent likewise contains an uphill pawl and a downhill pawl. (Sinha-OEIS)
W79-00032

DRIP IRRIGATION SYSTEM,
Du Pont de Nemours (E. I.) and Co. Wilmington, DE. (Assignee).
R. B. Duggins.
U.S. Patent No. 4,086,774, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 42, May 2, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, *Flow control, Water delivery, Application equipment, *Drip irrigation.

A drip irrigation system is disclosed in which individual drip irrigation tubes are fed from a header by means of a flow controller which feeds water to the irrigation tube at an essentially uniform rate over a wide variety of pressures in the header. Generally the flow controller will be capable of maintaining the flow within + or - 15% of a predetermined value within a pressure variation of from 3 to 60 psi. The flow controller is a housing containing a deformable member which deforms increasingly in response to water pressure. The more the deformable member deforms the smaller the effective opening controlling the water flow becomes so that the gallons per minute of water received by the drip irrigation tube remans relatively constant. (Sinha-OEIS)
W79-00038

ABOVEGROUND SPRINKLING DEVICE FOR SPRINKLING SYSTEM,
V. J. Traina.
U.S. Patent No. 4,087,-49, 6 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 137, May 2, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, Irrigation efficiency, Application equipment, Water delivery.

An aboveground sprinkling device has a sprinkler head at the center of its upper surface and has four sockets spaced at ninety-degree intervals around its side edge, all leading in to a central chamber immediately below the sprinkler head. An integral holding spike extends down from the bottom of the sprinkler head, preferably at the center, for holding the sprinkling device in a selected location. The spike is shaped to resist rotation. A set of plugs is provided to close the sockets that are not to be used. A hose or hoses can be secured to any one of the sockets or to several of them or to all of them to incorporate the device in a continuous sprinkler system employing a number of these sprinkling devices. The sockets not connected to hoses are plugged. (Sinha-OEIS)
W79-00059

SOIL, WATER AND AIR SCIENCES RESEARCH.
Science and Education Administration, Washington, DC.
For primary bibliographic entry see Field 2G.
W79-00105

NITRATE REDUCTASE ACTIVITY OF SOYBEANS IN RELATION TO OTHER INDICATORS OF WATER STRESS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2I.
W79-00149

EFFICIENCY OF SCREENLESS WELLS FOR IRRIGATION,
Ministry of Reclamation and Water Management, Moscow (USSR).
Y. Bogomolov, R. Stankevich, and N. Lapshin.
ICID Bulletin, Vol. 27, No. 2, July, 1978, p 77-80. 5 ref.

Descriptors: *Wells, *Well screens, Aquicludes, Aquifer testing, Aquifer characteristics, Exploration, Well construction, Intakes.

Problem related to the construction and use of screenless wells in artesian sand aquifers are discussed. There is more water intake surface and less hydraulic resistance in a screenless well which ensures high, steady yields for irrigation, water supply and dewatering. The major requirement for screenless wells is the availability of a steady upper confining bed overlying a sand aquifer. The confining bed must be fully penetrated by casing. The use of screenless wells in aquifer testing provides more accurate information on the hydrogeologic parameters of aquifers. The use of small-diameter screenless wells in aquifers previously regarded as non-productive has facilitated development of large scale water supplies. Screenless wells reduce the costs of ground-water exploration and management well construction and operation of water intake structures. Further research and development of screenless wells will contribute significantly to well drilling technology. (Purdin-NWWA)
W79-00184

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975. SUMMARY REPORT.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
Federal Reclamation Projects, 57 p, 7 tab. One of 4 volumes. (1976).

Descriptors: *Land reclamation, *Irrigation programs, *Crop response, *Irrigable land, *Flood control, Irrigation operation and maintenance, Recreation, Use rates, Hydroelectric power, Crop yield, Water supply, Agriculture, *Soldier Creek Dam(UT), *Western United States, *Environmental enhancement, Research and development, Irrigation management service, Youth conservation corps, Nonagricultural lands.

This volume is the annual report of the Bureau of Reclamation water and land resource accomplishments for 1975. These accomplishments are in the areas of irrigation; development of municipal, industrial and other nonagricultural water supplies; recreation; flood control; and power. Summaries of planning construction and research activities are also provided, as well as environmental enhancement activities, youth conservation programs and foreign activities. The report investigates these areas in detail and furnishes data on subjects such as acreage, yield, production, extension of irrigation to new lands, gross value of crops grown on all Reclamation projects, populations served by projects and other subsections of the areas. The focus is from a national viewpoint looking at the western half of the United States. Accomplishments by Reclamation project operations in 1975 were achieved through facilities consisting of 326 storage reservoirs, 355 diversion dams, 14,320 miles of canals, 900 miles of pipeline, 230 miles of project drains, 142 pumping plants, 50 power plants, and 16,250 circuit miles of transmission lines. These facilities include those constructed by others and in operation on Reclamation projects. These project facilities are usually constructed by the Bureau of Reclamation, but the operation and maintenance of the facilities is turned over to local water users as they become capable of administering them. Three appendices provide statistical summaries for Reclamation project data. (See W79-00192 thru W79-00194) (Coan-NC)
W79-00191

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX I.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
Federal Reclamation Projects, 284 p, Appendix 1 of 3 plus Summary Volume (1976).

Descriptors: *Cultivated lands, *Crop value, *Productivity, *Recreation usage, *Water distribution, *Land reclamation, *Irrigation programs, Water resources, Land resources, Agriculture, Regional analysis, Pacific Northwest Region, Mid-Pacific Region, Lower Colorado Region, Upper Colorado Region, Southwest Region, Upper Missouri Region, Lower Missouri Region, Acquired lands, Withdrawn lands, Easement lands, Western United States.

This volume is one of 3 statistical appendices to the 70th annual report on water and land resource accomplishments of the Bureau of Reclamation. It contains administrative information for use by the Bureau and others wishing detailed information on specific Reclamation projects. It includes regional and project data on acreage, yield, production, and gross value of crops grown; land utilization; water distribution; status of Reclamation lands, and other related topics. Regional summaries are provided for seven major regions of the United States--Pacific Northwest, Mid-Pacific, Lower Colorado, Upper Colorado, Southwest, Upper Missouri, and Lower Missouri regions. Detailed project data are presented. This statistical appendix provides information useful to analysts preparing economic and financial studies of Reclamation projects. The appendix has also been used in the settlement of disputes arising out of conflicts over water charges and allowances, crop damage claims, operation and maintenance charges, and adjustment to repayment contracts. This statistical series is intended to be an annual project so that minute historical investigations may be accomplished. (See also W79-00191) (Coan-NC)
W79-00192

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
Federal Reclamation Projects, 190 p, Glossary, Map, Appendix 2 of 3 plus Summary Volume (1976).

Descriptors: *Hydroelectric power, *Investment, *Repayment contracts, *Construction costs, *Irrigation programs, *Annual costs, *Cost repayment, Irrigation facilities, Debt, Cost allocations, Employment, Land resources, Water resources, Return(Monetary), *General Reclamation statistics, *Federal funds, *Nonagricultural lands, *Municipal water, *Industrial water, Annual appropriations, Irrigable acres, Western United States.

This volume is one of 3 statistical appendices to the 70th annual report on water and land resource accomplishments of the Bureau of Reclamation. These sets of summary tables provide extensive documentation of various aspects in Bureau Reclamation projects. The volume makes available annual tables of key financial and physical statistics. Included among the most important financial statistics are repayment of Reclamation Project construction costs and repayment of reimbursable costs, by repayment contracts and commercial power revenues, and statements of net i
come from various irrigation and electric pow
operations. Important physical data statistics a
storage and conveyance features in operatio
storage dams, dikes and reservoirs, diversio
dams, and carriage facilities for canals, pipelin
and tunnels. A major section deals with pow
plant and transmission line data giving their phys
cal features and generation and sale of energ
Another section of tables deals with the history
Congressional appropriation acts making fun
available for Reclamation projects. The sour
and disposition of the Reclamation Fund is brok
down by listing accretions, collections, reimburs
ments, and loans to the fund. The appendix also i
cludes a glossary of critical terms requiri
specific definitions for proper interpretation of t
Bureau's reports. (See also W79-00191) (Coa
NC)
W79-00193

WATER AND LAND RESOURCE ACCO
PLISHMENTS 1975, STATISTICAL APPENDI
III--PROJECT DATA.
Bureau of Reclamation, Washington, D
Economics and Program Analysis Branch.
Federal Reclamation Projects, 381 p, Index, A
pendix 3 of 3 plus Summary Volume (1976).

Descriptors: *Operating costs, *Maintenan
costs, *Cost repayment, *Project feasibilit
*Irrigation programs, Land productivity, La
resources, Water resources, Recreation, Agric
ture, *Colorado River Storage, *Recreation area
*Pick-Sloan Missouri Basin Program, Collection
Contributions, Colorado Development Fund, A
crued expenditures, Carriage facilities, Weste
United States.

This volume is one of 3 statistical appendices
the 70th annual report on water and land resourc
accomplishments of the Bureau of Reclamation.
provides a micro-level view of various aspects
active construction and completed Reclamati
projects. The projects are located throughout t
western half of the United States, with the Pic
Sloan Missouri Basin Program receiving close i
spection. A glossary of critical terms is provid
with their definitions so that the tables are easi
interpreted. Each project is broken down in
several schedules listing topics such as gene
data on location and history, cumulative financi
data, cost allocations and ultimate repayme
data, amounts of funds per irrigable acre, status
repayment contracts and data on recreation
areas. Not all projects have completed data on t
several schedules, and some contain only spar
information. (See also W79-00191) (Coan-NC)
W79-00194

EFFECT OF SULFUR DEFICIENCY O
WATER REGIME AND INTENSITY OF PE
AND WHEAT PHOTOSYNTHESIS, (IN RU
SIAN),
Krasnoyarsk State Univ. (USSR).
For primary bibliographic entry see Field 2I.
W79-00200

EFFECT OF SOIL-INJECTED ETHYLENE O
SUGARBEET (BETA VULGARIS L.) YIEL
PARAMETERS,
Arizona Univ. Tucson. Dept. of Plant Sciences.
L. J. Francl, R. E. Dennis, D. K. Parsons, and A.
H. Froytag.
Journal of the American Association of Sugarbe
Technologists, Vol. 19, No. 4, p 331-336. 3 tab,
ref. OWRT A-034-ARIZ.(4), 14-31-0001-5003.

Descriptors: *Sugarbeets, *Ethylene, Sugar yiel
*Crop production, Arizona.

The first field experiment was located
southeastern Arizona in 1974. Ethylene gas was i
jected into a furrow 20 cm below the soil surfac
at a rate of 6.2 kg/ha. Each test plot consisted of

located 1, 5, 10, or 50 rows from the place of
lene injection. The rows were 76 cm apart.
ts in the first experiment were mechanically
ested, weighed, and sampled to determine the
r content. Sugar/ha was 16.5% higher in the
nearest the applied ethylene than in the row
ted 37.7 m from the place of application.
ough not statistically different, this finding
npted further field experiments. In March of
, field experiments in central Arizona were in-
ed. The methodology used for these experi-
ts closely followed that of the first field ex-
ment. There were no significant differences at
5% level among the ethylene treatments on
weight, sugar percentage, or sugar/ha in any
hese field tests because of high experimental
ability. The results in this study were variable
thus do not support the conclusion that soil in-
ions of ethylene can be used to increase yield
sugarbeets under the described conditions.
ther research should be directed toward find-
the optimum rate and date of ethylene applica-
, and optimum soil and environmental condi-
s.
9-00296

IGATION EFFICIENCY, A BIBLIOG-
PHY, VOLUME 3.
partment of the Interior, Washington, D. C.,
ice of Water Research and Technology.

ilable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-287 626,
e codes: A10 in paper copy, A01 in microfiche.
ter Resources Scientific Information Center
ort OWRT/WRSIC 78-202, June 1978. 99 p, 3
end.

scriptors: *Irrigation efficiency,
bliographies, Crop production, Co-op
onse, Irrigation practices, Trickle irrigation,
inkler irrigation, Salinity control, Water quali-

s report, containing 260 abstracts, is another in
series of planned bibliographies in water
ources produced from the information base
nprising SELECTED WATER RESOURCES
STRACTS (SWRA). Volumes 1 and 2 (see
7-03168 and W73-09115) covers information an-
nced in SWRA from October 1968 through
tember 1976. This volume covers the period
m October 1976 through June 1, 1978. Author
subject indexes are included.
9-00307

UNT METERS WITH SEGMENTAL ORI-
ES,
lorado State Univ., Fort Collins. Dept. of Civil
gineering.
. Ruff.
nsactions of the American Society of Agricul-
al Engineers, Vol. 21, No. 4, p 719-722, July-
gust 1978. 6 fig, 1 tab, 4 ref.

scriptors: *Flow measurement, *Irrigation,
pe flow, *Instrumentation, Laboratory tests,
ibrations, Orifices, Flow, Measurement, Pipes,
gation systems, Engineering, Agricultural en-
eering, Hydraulics, Agriculture, *Shunt meters.

inexpensive shunt meter to monitor irrigation
ws was described. The meter was constructed
ng a segmental orifice, any household water
ter, and standard piping. The discharge rating
ves for several orifices with different dam
ghts that can be used in 20.32 cm and 26.04 cm
n and 10 in) pipes were presented. Using these
ves and a simple manometer, the shunt meter
be field adjusted to give the desired coefficient
ating the total volume of flow to the volume in-
ated by the shunt meter. (Sims-ISWS)
9-00335

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,
Research Inst. of Forests and Rangelands, Tehran (Iran).
For primary bibliographic entry see Field 3B.
W79-00474

WATER HARVESTING FOR AFFORESTATION: II. SURVIVAL AND GROWTH OF TREES,
Research Inst. of Forests and Rangelands, Tehran (Iran).
For primary bibliographic entry see Field 3B.
W79-00475

CONTROL OF FURROW INFILTRATION BY COMPACTION,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
M. Khalid, and J. L. Smith.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 654-657, July-August 1978. 10 fig, 2 tab, 3 ref.

Descriptors: *Furrows, *Furrow irrigation, *Soil compaction, *Infiltration rates, Compaction, Compacted soils, Infiltration, Equipment, Mechanical equipment, On-site investigations, Irrigation, Mechanical engineering, Agricultural engineering, Agriculture, Soil compactors.

Sandy soils are difficult to irrigate by surface methods due to their high infiltration rates. Using an impact furrow compactor, the infiltration rate was reduced 40% at the first irrigation. A crust, formed on the soil after the first irrigation, controlled the infiltration rate on subsequent irrigations. The same size of compacted and noncompacted furrows required approximately the same power. (Sims-ISWS)
W79-00481

PIPE SIZES FROM MODIFIED MOODY DIAGRAM,
Michigan Univ., Ann Arbor. Dept. of Applied Mechanics and Engineering Science.
W. Debler.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. HY1, p 81-85, January 1977. 1 fig, 2 ref, 20 equ.

Descriptors: Hydraulics, Hydraulic design, *Irrigation design, Irrigation engineering, *Moody resistance diagram, *Pipe flow, Pipes, Pipelines, Dimensional analysis.

In the course of developing some instructional material, a simple procedure evolved to extend the useful information contained on the Moody Diagram. Concurrently, the essence of that work's results was published by Lai and Lee. Nevertheless, a different point of view had been adopted in the development which makes the final result useful, especially if one wishes to demonstrate the utility of dimensional analysis. (Skogerboe-Colorado State)
W79-00499

PROFILE ACCUMULATION OF FERTILIZER-DERIVED NITRATE AND TOTAL NITROGEN RECOVERY IN TWO LONG-TERM NITROGEN-RATE EXPERIMENTS WITH CORN,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 2G.
W79-00500

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-00095

APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC PLANNING,
ECOsystems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W79-00099

FIELD INVESTIGATION OF SELECTIVE WITHDRAWAL,
California Univ., Berkeley. Dept. of Mechanical Engineering.
G. Ivey, and J. Imberger.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No. HY9, Proceedings Paper 14029, p 1225-1237, September 1978. 4 fig, 3 tab, 6 ref, 2 append.

Descriptors: *Reservoir operation, *On-site investigations, *Discharge(Water), *Stratification, *Australia, On-site data collections, On-site tests, Water properties, Water temperature, Dissolved oxygen, Conductivity, Analysis, Analytical techniques, Lakes, Reservoirs, Mixing, Foreign research, *Western Australia, *Wellington Reservoir(Western Australia), Selective withdrawal.

A field investigation of the steady-state thickness and extent of a withdrawal layer in a startified resevoir was reported. Existing theory indicated that, throughout the study period, the withdrawal layer was in a steady state in the regime governed by a balance between buoyancy and viscous forces. A natural salt tracer in the water enabled estimates of the mean withdrawal layer thickness over a 10-km (6.2-mile) length upstream from the snk for two different time periods. To achieve good agreement between theoretical predictions and field measurements, it was necessary to postulate transport coefficients of momentum approximately 10 times the molecular value. Comparisons with model simulations over the same time period suggested an effective average Prandtl number of 20 in the hypolimnion. (Humphreys-ISWS)
W79-00119

AN ESTIMATE OF ANNUAL RUNOFF FROM ENGLAND AND WALES, 1728-1976,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 2E.
W79-00124

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6B.
W79-00142

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975. SUMMARY REPORT.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00191

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX I.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00192

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00193

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX III--PROJECT DATA.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00194

SUMMARY OF STUDY FINDINGS, PHASE I REPORT: ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 4C.
W79-00195

CONTROL OF AQUATIC WEED BY MOTH LARVAE,
Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station.
H. Chaudhuri, and K. Janaki Ram.
Nature, Vol. 253, No. 5486, p 40-41, January 3, 1975. 14 ref.

Descriptors: *Biocontrol, *Aquatic weeds, *Insects, *Larvae, Floating plants, Fisheries, Wetlands, Aquatic plants, India.

Larvae of the moth, Erastroides curvifascia Hampson, feed specifically on foliar and stem portions of Pistia stratiotes, a common noxious floating weed. The moths breed readily in the laboratory and can be transferred in situ to host plants with comparative ease. (Stihler-Mass)
W79-00197

CATTAILS (TYPHA SPP.)--WEED PROBLEM OR POTENTIAL CROP.,
Miami Univ., Coral Gables, FL.
For primary bibliographic entry see Field 2I.
W79-00198

OVERGROWING OF THE KARA KUM CANAL AND SOME AFTEREFFECTS OF INTRODUCING THE WHITE AMUR INTO WATER BODIES, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Inst. Botaniki.
Sh. I. Kogan.
Gidrobiol Zh 10(2), p 110-115, 1974.

Descriptors: *Aquatic weed control, Aftereffects, Canals, *Ctenopharyngodon idella, *Kara-Kum Canal, *Microcystis aeruginosa, *Reservoirs, *White amur, USSR.

Because of the absence of submersed plants, the white amur (Ctenopharyngodon idella) is deprived of a food base in the Kara-Kum Canal (USSR) and it is assumed that its number in the canal in recent years is insignificant. The number of white amur in catches from the canal and water bodies connected with it is steadily declining. There are a number of reservoirs on the Kara-Kum canal and here the role of the white amur as a biomeliorator is apparent. The increase of the abundance and biomass of phytoplankton in 2 reservoirs occurred because of Microcystis aeruginosa, an undesirable organism. Apparently collector-drainage canals are the only type of water body in which the white amur can be used without restriction for weed control. Copyright 1977, Biological Abstracts, Inc.
W79-00207

LOW-FLOW CHARACTERISTICS OF OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-00257

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE OLYMPIC PENINSULA, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-00258

MODEL OF THE FLOODING CAUSED BY THE FAILURE OF THE LAUREL RUN RESERVOIR DAM, JULY 19-20, 1977, NEAR JOHNSTOWN, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-00263

THE HISTORIC LEVEL OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, UT., Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-00264

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00265

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00266

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1977.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00267

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00268

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. Buono, K. W. Causseaux, and J. E. Moore.
Open-file report 78-331, May 1978. 88 p, 45 fig.

Descriptors: *Water resources, *Projects, *Publications, *Abstracts, *Bibliographies, Groundwater, Surface waters, Water quality, Streamflow, Water supply, Water utilization, Water resources development, Reviews, *Florida, Southwest Florida.

This report summarizes the activities of the Southwest Florida Subdistrict of the U.S. Geological Survey, Water Resources Division for fiscal year 1977. The organization and mission of the subdistrict office are described. The cooperative program for fiscal year 1977 included 41 interpretive investigations. Abstracts of twenty reports released by the subdistrict during 1977 and an extensive bibliography of reports released from 1933 to 1977 are included. The hydrologic setting of southwest Florida is outlined followed by discussions of surface-water, ground-water, and quality-of-water conditions. Hydrologic conditions in southwest Florida in 1977 are shown by the presentation of hydrographs from selected surface-water, ground-water, and lake-stage data collection sites.
W79-00272

HIGH-FLOW FREQUENCIES FOR SELECTED STREAMS IN OKLAHOMA,
Geological Survey, Oklahoma City, OK Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-00273

FLOOD REGIONS IN JAMAICA,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-00330

SIMULATION OF FLOWS IN UNGAGED BASINS,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2E.
W79-00331

STOCHASTIC PROCESSES IN WATER RESOURCES ENGINEERING.
Lund Inst. of Tech. (Sweden). Dept. of Water Resources Engineering.
For primary bibliographic entry see Field 8B.
W79-00380

STORMWATER MODELING,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00381

LAKE LEVEL CONTROL AND MANAGEMENT--A CASE STUDY,
Barr Engineering Co., Minneapolis, MN.
I. Yomtovian.
Water Resources Bulletin, Vol. 14, No. 5, p 1176-1186, October 1978. 3 fig, 2 tab, 4 ref.

Descriptors: *Water resources, *Alternative planning, *Flood control, *Lake management, Hydrology, Flood damage, Lake level, Exceedence probabilities, Decision making, Methodology, Cost-effectiveness, Chicago Chain of Lakes(Minn), Minnesota.

The frequent high water levels in the Chicago Chain of Lakes, located in east-central Minnesota, have caused extensive flood damages. Recent floods raised the concern of the local property owners, and they pressured the Chisago County Board of Managers to initiate a study of alternative lake control levels. A study was accomplished to identify potential flood control alternatives, screen out the most promising feasible alternatives, and recommend the most cost-effective

control measure. Several flood control alter-
es were considered--eight of them were
zed and evaluated in detail. A statistical
od was used to estimate the expected annual
damages under existing and future condi-
The effect of all proposed control measures
e annual flood damage reductions (benefits)
determined. Detailed benefit/cost analyses
carried out to evaluate the economic feasi-
of alternatives. The effect of potential flood
ol measures on the environment was also stu-
The economic analysis of the most cost-ef-
ve alternative did not strongly support artifi-
ake level control; therefore the decision-mak-
uthorities were even more firm in their posi-
o maintain the present condition and chose
Jull Alternative as the most suitable alterna-
(Bell-Cornell)
00390

IMAL OPERATION OF SHELBYVILLE CARLYLE LAKES,
is State Water Survey, Urbana.
Singh.
r Resources Bulletin, Vol. 14, No. 5, p 1201-
October 1978. 4 fig, 3 tab, 9 ref.

riptors: *Reservoir operation, *Flood con-
*Simulation analysis, *Multiple-purpose
voirs, *Evaluation, *Operating rules,
imization, Recreation, Crops, Model studies,
omic efficiency, Lakes, Dams, Rivers, Il-
, Dynamic programming, Computer pro-
s, Reservoir releases, Joint operation,
age minimization, Benefit maximization,
ems analysis.

s were built by the U.S. Army Corps of En-
rs on the Kaskaskia River at Shelbyville and
yle in Illinois in 1969 and 1967 respectively.
ration of the Shelbyville and Carlyle Lakes
changed over the years due to considerably
r bankfull channel capacities downstream of
ams than were adopted in the project designs.
study was conducted to review the present
ation policy. The intent was to derive a policy
naximizing the overall benefits (or minimizing
overall damages) and to compare these
fits or damages with those of the present pol-
The operating rules were optimized through a
lation model which was structured consider-
the physical nature of the system and the
rable operation in the best interest of various
ficial uses. The expected annual value of
all benefits from recreation and agriculture is
vn to increase by $0.2 million with the optimal
y. With the optimal joint operation, the
all damages are reduced by 76 percent on the
age over the 24 years of flow record at Shel-
lle and Carlyle. (Bell-Cornell)
-00392

APPLICATION OF LINEAR PRO-
AMMING TO RUN-OFF MANAGEMENT,
onal Inst. of Agricultural Engineering, Silsoe
land).
. Potter, R. P. C. Morgan, and D. H. Noble.
nal of Environmental Management, Vol. 6,
1, p 43-55, January 1978. 4 tab, 30 ref.

criptors: *Watershed management, *Linear
ramming, *Runoff, *Land use, *Hydrology,
mization, Planning, Constraints, Evaluation,
ations, Operations research, Runoff minimiza-
Sensitivity analysis, Economic considera-
s.

following linear programming model is
ented and solved for the purpose of con-
ing runoff by land use management in small
hments: minimize Z = (sum from c = 1 to c =
im from i = 1 to i = m)(sum from t = 1 to t =
f Q sub(cit) A sub(cit) where Q is the runoff
unit area for the cth compartment (land unit)
er the ith land use activity in the tth time
od, and A is the area of the cth compartment
under the ith land use activity in the tth time period. The model is demonstrated with constraints placed on the total area of each land unit, prescribed areas for selected land use activities, continuity (where appropriate) of land use activities over several time periods, and available resources of labor and capital (optional). (Bell-Cornell)
W79-00393

RECLAMATION OF MEADOW-CHERNOZEM SOLONETZES OF THE KUSTANAI OBLAST, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.
For primary bibliographic entry see Field 2G.
W79-00395

POSSIBLE USE OF POLYMERIC MATERIALS FOR FORTIFICATION OF DRAINAGE FILLS (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
A. I. Mosolova, and V. F. Utkaeva.
Biol Nauki (Mosc) 19(9), p 116-122, 1976.

Descriptors: *Polymers, Polymeric materials, Acetate, Acrylamide, Acrylic-acid, Acrylonitrile, Alcohol, Carbamide, Ethanol, Hypan, K-4, K-9, Loam, Podzolic soils, Pyrrolidone, Sandy soils, Sod, Stability, USSR, Water glass.

A series of polymeric preparations were used to artificially fortify sod-podzolic sandy loam on carbonate loam morraine and sandy soil of the Katinin oblast (Russian SFSR, USSR). The polymers increased water stability by 2-5 times. The polymers used were K-4, K-9, Hypan, polyacrylamide, polyvinyl alcohol, polyoxyethanol, water glass with acrylic acid, a copolymer from vinylpyrrolidone and acrylonitrile, a copolymer from vinylpyrrolidone, acrylic acid and carbamide, acrylic acid and ammonium carbonate and a preparation made of acrylic acid and vinylacetate.--Copyright 1978, Biological Abstracts, Inc.
W79-00439

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00447

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS,
Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Department.
For primary bibliographic entry see Field 4C.
W79-00450

OPERATING MODEL FOR THE GREEN RIVER BASIN RESERVOIR SYSTEM,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
C. Rukvichai.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 119, Price codes: A12 in paper copy, A01 in microfiche. PhD Dissertation. 1977. 255 p, 58 fig, 21 tab, 72 ref, 9 append. OWRT A-026-IND(6), B-094-IND(1).

Descriptors: *Reservoir operation, *Reservoir management, Competing uses, Reservoir releases, Routing, Reservoir storage, Model studies, *Kentucky, *Green River Basin(KY).

This study was concerned with the operation of the four reservoirs of the Green River Basin in Kentucky. This reservoir system is regulated by the Corps of Engineers. The purpose was to gain some insight of the current practices in regulating the reservoir system and identify the systematic experimental determinants such that an algorithm could be developed. A longer range goal was to have the Corps adopt the system and then take up the question of an optimal operation. An operating model called GRBOPM was constructed using a daily simulation model which is in the form of a computer routine package. The model has three main components, namely the reservoir routing component, RESROUT; the stream flow routing component, GRBSYS; and the operating policy component, POLICY. The on-line use of GRBOPM was studied to assist in the regulation of the reservoir system in real time. Two simulation runs for the on-line use were performed in the 'forecasting mode' and in the 'analysis mode'. The results were compared with historical data. (Wiersma-Purdue)
W79-00452

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 4C.
W79-00460

AGRICULTURAL AND HYDROLOGICAL APPLICATIONS OF RADAR: FINAL REPORT,
Kansas Univ. Space Technology Center, Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W79-00464

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,
Research Inst. of Forests and Rangelands, Tehran (Iran).
For primary bibliographic entry see Field 3B.
W79-00474

WATER HARVESTING FOR AFFORESTATION: II. SURVIVAL AND GROWTH OF TREES,
Research Inst. of Forests and Rangelands, Tehran (Iran).
For primary bibliographic entry see Field 3B.
W79-00475

TOTAL PHOSPHORUS TRANSPORT DURING STORM EVENTS,
West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-00478

SIMPLE SAMPLER ACTIVATION AND RECORDING SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W79-00480

CONTROL OF WATER RESIDENCE TIME IN SMALL RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
F. R. Schiebe, and F. E. Dendy.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 666-670, July-August 1978. 8 fig, 1 tab, 6 ref.

Descriptors: *Reservoirs, *Suspended solids, *Reservoir operation, *Model studies, Laboratory tests, Hydraulic models, Dye releases, Inflow, Discharge(Water), Mixing, Water circulation, Analytical techniques, Sediments, Sediment Control, Lakes, Limnology, *Residence time, Small reservoirs.

A small laboratory reservoir was used to investigate the water residence time in various density stratification and selective withdrawal situations. Dyed reservoir water was diluted by clear, temperature-controlled, inflowing water. The experimental results were analyzed in terms of two simple analytical models. Conditions required for minimum and maximum mixing of the inflowing water, maximum storage of the inflowing water, and maximum bypass of the inflowing water were investigated. All four conditions were successfully produced in the experimental reservoir. The results indicated that natural stratification, along with a selective withdrawal system, can either maximize or minimize the water residence characteristics of an impoundment. Thus, time available for sediment settling can be changed by manipulating the location of the withdrawal structure in the reservoir. (Sims-ISWS)
W79-00482

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Science and Education Administration, Temple, TX. Grassland-Forage Research Center.
V. L. Hauser.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 691-695, July-August 1978. 9 fig, 1 tab, 12 ref.

Descriptors: *Linings, *Clays, *Gravels, *Aggregates, *Seepage control, Canal linings, Reservoirs, Canals, Hydraulic conductivity, Permeability, Soils, Sands, Seepage, Pores, Porosity, Particle size, Soil water, Soil water movement.

Earth linings are used frequently in reservoirs, canals, and other earth structures to control liquid movement for the purposes of pollution control, water conservation, and structural stability. Clays or chemicals often are added to linings to reduce the hydraulic conductivity of the native soil; however, both additives sometimes decrease in effectiveness with time. Under ordinary conditions, gravel is nearly inert and does not change properties with time. The hydraulic conductivity of permeable soil was reduced substantially by adding gravel that was at least 15 times larger than the particle size of the soil. The amount of clay required to control seepage was reduced by half by the addition of gravel. (Sims-ISWS)
W79-00484

POTENTIAL AND LIMITATIONS OF RAINFALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS,
Papua New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W79-00491

4B. Groundwater Management

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,
Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W79-00003

ENERGY CONVERSION SYSTEM,
E. H. Schwartzman.
U.S. Patert No. 4,084,379, 15 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 834-835, April 18, 1978.

Descriptors: *Patents, *Geothermal studies, *Thermal conductivity, *Heat transfer, Energy conversion, Energy transfer, Gases, Electrical power production, Working fluid.

The most abundant type of geothermal energy consists of a hot thermally heated fluid usually saturated with many dissolved solids such as silica, dissolved calcium, calcium oxide, carbonates, ad various other soluble salts, the most common being sodium chloride. A simple direct contact energy exchange is provided in such a manner as to prevent any of the liquids employed, which may contain solutes, from coming into contact with any surfaces of the components used in the system. A working fluid, which is immiscible in water and which has the desired thermodynamic properties, is used to absorb energy from the fluid source by direct heat transfer. This exchange of energy is accomplished by the complete vaporization of the working fluid and a small portion of the liquid fluid source. The composition of the produced vapor is controlled by the given temperature and pressure at which the process takes place and in turn is dependent on the thermodynamic properties of the working fluid employed and the flow rate of both the working fluid and the energy source fluid. The resulting vapor mixture is then utilized directly by expansion through a power producing device such as a turbine to produce power. (Sinha-OEIS)
W79-00037

PROCESS AND SYSTEM FOR RECOVERY OF ENERGY FROM GEOTHERMAL BRINES AND OTHER WATER CONTAINING SOURCES BY DIRECT CONTACT WITH A WORKING FLUID BELOW THE CRITICAL PRESSURE,
Occidental Petroleum Corp., Los Angeles, CA. (Assignee).
S. G. Woinsky.
U.S. Patent No. 4,089,175, 13 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No. 3, p 832, May 16, 1978.

Descriptors: *Patents, *Geothermal studies, *Heated water, *Heat transfer, Heat exchangers, Temperature, Pressure, Condensation, Brines, Electric power production, Thermal powerplants, Working fluid.

A process and system are described for recovering energy from geothermal brines and other water containing or hot water sources such as ground waters heated by solar energy or other means, the energy being recovered from the brine or hot water using a working fluid such as a hydrocarbon, e.g. n-butane. The working fluid is heated in a direct contact heat transfer column. The heated working fluid is passed through an expander to product work, which is used to generate electricity or drive equipment. The working fluid is then condensed in a cooler. Condensed working fluid, water and uncondensed gas are separated in an accumulator. The cool liquid working fluid is pumped from the accumulator to the heat transfer column to be heated and carried through the cycle repeatedly. Cooled brine or water which heated the working fluid exits from the bottom of the column which acts as a liquid-liquid separator to minimize entrainment of the working fluid. This cooled brine or water is mixed with water separated from the working fluid in the accumulator, and is flashed at a pressure lower than that in the accumulator to flash of entrained and dissolved working fluid. The flashed working fluid is then compressed and fed to the cooler at the discharge from the expander and is thus recovered. An important feature residues in operating the heat transfer column so that the top of the column is in the subcritical pressure region of the working fluid close to or approaching the apex of the saturated vapor curve on the Moller diagram for such fluid. (Sinha-OEIS)
W79-00049

ELECTRICAL-RESISTIVITY SURVEYS FOR GROUNDWATER IN THE DECCAN TRAP COUNTRY OF SANGLI DISTRICT MAHARASHTRA,
Geological Survey of India, Hyderabad.
R. N. Bose, and T. S. Ramakrishna.
Journal of Hydrology, Vol. 38, No. 3/4, p 209-22
August 1978. 7 fig, 4 ref.

Descriptors: *Groundwater, *Electrical co ductance, *Surveys, *Water wells, On-site i vestigations, Droughts, Foreign countries, Wat supply, Foreign research, Water yield, Well Shallow wells, Flow rates, Potable wate Hydrogeology, *India.

The results are presented of electrical-resistivit surveys carried out to guide the shallow tubewe drilling program aimed at alleviating the drinkin water scarcity in the drought-stricken villages parts of Sangli District, Maharashtra. The resul showed that a combination of resistivity soundin and profiling is more effective in tacklin problems for the location of wells in the Decca trap country. The indispensability of resistivit profiling for detecting a shallow source of groun water in fractured/fissured zones in basaltic trap was highlighted. (Sims-ISWS)
W79-00107

ON THE TWO-DIMENSIONAL GROUNDWATER MOVEMENT,
Thessaloniki Univ., Salonika (Greece). Faculty Technology.
For primary bibliographic entry see Field 2F.
W79-00108

DIGITAL MODEL STUDIES OF UNSTEADY STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W79-00111

INFLUENCE OF STRIP MINES ON REGIONAL GROUND-WATER FLOW,
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00118

KRIGING IN THE HYDROSCIENCES,
Ecole Nationale Superieure des Mines de Paris Fontainebleau (France). Center for Geological I formation.
For primary bibliographic entry see Field 2F.
W79-00134

TYPE-CURVE ANALYSIS OF TIME-DRAWDOWN DATA FOR PARTIALLY PENETRATING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W79-00136

WATER ANALYTICAL DATA AS A TOOL I DRILLING AND PRODUCTION ECONOMICS,
For primary bibliographic entry see Field 8G.
W79-00168

OIL-TROUBLED WATER,
American Ground Water Consultants, A buquerque, NM.
For primary bibliographic entry see Field 5B.
W79-00169

CONJUNCTIVE USE OF GROUND AND SURFACE WATER,
Infotech, Tehran (Iran).

aknoon, and S. J. Burges.
nal of the American Water Works Associa- Vol. 70, No. 8, p 419-424. 1 fig, 1 tab, 25 ref.

riptors: *Conjunctive use, *Water manage- (Applied), *Systems analysis, Optimum lopment plans, Groundwater, Surface water, ace-groundwater relationships, Mathematical els, Water resources development.

lelines are presented for using a systematic ap- ch in future analyses of conjunctive ground- ace water systems. The history of the develop- t of analytical techniques for conjunctive use ems over the past 25 years is summarized and physical, social, legal, and economic factors interact in conjunctive use systems are tified and discussed. Steps required in syste- c analysis of conjunctive use systems are: (1) ning the nature, level, and scale of the blem, (2) analyzing the problem by identifying defining the analysis objectives, significant ables, data availability, constraints, and alter- ve solutions; (3) modeling of appropriate alter- ves that respond to system objectives; and (4) lementing the chosen optimal policy by setting a system management structure, developing lback mechanisms, an information system, and ata-gathering network. Low-cost analyses of junctive use systems may be possible only en considerable management latitude is availa- However, it is unlikely that large expenditure extremely sophisticated modeling efforts will d management practices vastly improved over se obtainable through less expensive analyses. ations where data are limited or very costly require the use of coarser spatial and tem- al scales. This, in turn, means that the policy lemented will be conservative. (Purdin- WA)
9-00170

WATER-SOURCE DAMAGE FOUND IN OIL ATES.
primary bibliographic entry see Field 5G.
9-00172

GIONAL GEOLOGY SERIES: PART VII, E COLORADO PLATEAU,
tional Water Well Association, Worthington,
primary bibliographic entry see Field 8B.
9-00177

USING PROJECT TO UTILIZE GROUND ATER.
primary bibliographic entry see Field 8C.
9-00178

W APPROACH GETS RESULTS IN UTAH ELL,
lian Health Service, Phoenix, AZ. Office of En- onmental Health.
primary bibliographic entry see Field 8B.
9-00181

ELL POINT SYSTEMS.
primary bibliographic entry see Field 8C.
9-00182

ATER USAGE REQUIRES PLANNING,
iversal Oil Products, Inc., Saint Paul, MN. nson Div.
primary bibliographic entry see Field 6D.
9-00183

ROUNDWATER PUMPING TECHNIQUES R EXCAVATIONS AND OTHER WORKS,
primary bibliographic entry see Field 8G.
9-00185

MAPS SHOWING WATER-LEVEL DECLINES, LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.; and Bureau of Reclamation, Phoenix, AZ. Arizona Dept. of Transportation, Phoenix.
For primary bibliographic entry see Field 7C.
W79-00251

GROUNDWATER QUALITY ATLAS OF NEBRASKA,
Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln.
For primary bibliographic entry see Field 7C.
W79-00252

GROUND-WATER DATA, 1974-76, INDIAN WELLS VALLEY, KERN, INYO, AND SAN BERNARDINO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00253

HYDROGEOLOGIC RECONNAISSANCE OF THE MEKONG DELTA IN SOUTH VIETNAM AND CAMBODIA,
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00255

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00256

GROUND-WATER LEVELS IN WYOMING, 1977,
For primary bibliographic entry see Field 7C.
W79-00259

GROUND-WATER AVAILABILITY IN THE HITCHCOCK-RED WILLOW, FRENCHMAN VALLEY, AND MEEKER-DRIFTWOOD IRRIGATION DISTRICTS, SOUTHWEST NEBRASKA,
Geological Survey, Lincoln, NE. Water Resources Div.
E. G. Lappala, P. F. Hemphill, and R. E. Booker.
Open-file report 78-461, 1978. 49 p, 20 fig, 3 tab, 10 ref.

Descriptors: *Surface-groundwater relationships, *Groundwater availability, *Supplemental irrigation, *Computer models, *Nebraska, Aquifer characteristics, Surface waters, Water demand, Water supply, Hydrologic data, Aquifer management, *Ogallal Formation, *Southwest Nebraska, Frenchman Creek, Republican River.

Surface-water supplies are diminishing in the Hayes-Red Willow and Frenchman Irrigation Districts in soutwest Nebraska. Stream depletions due to ground-water withdrawals upstream from Enders Reservoir have resulted in a shortage of about 8,700 acre-feet per year. The availability of ground water in two surficial aquifers was examined as a possible supplemental supply. The most productive aquifer comprises alluvial deposits in the valleys of the Republican River and Frenchman Creek. The Ogallala Formation, which underlies the remainder of the area is a less productive aquifer except locally. Water levels have risen as much as 20 feet north of the Republican River and as much as 40 feet south of the river. Ground water inflow to the Republican River has increased about 3 percent. A digital model of the aquifer system was used to assess the potential for providing supplemental supplies from two well configurations and from existing irrigation wells. The first well configuration could sustain a maximum of 25 percent of the 1976 deficit with maximum stream depletions of 11 percent to Frenchman Creek and 60 percent to Blackwood Creek. The second well configuration could sustain 25 percent of the 1976 deficit with stream depeletions of less than 5 percent at the end of 19 years. Existing wells are adequate to irrigate district lands on which they are located for at least 19 years.
W79-00260

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00265

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00266

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1977.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00267

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00268

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-00272

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF CUSTER AND FREMONT COUNTIES, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
C. J. Londquist, and R. K. Livingston.
Water-Resources Investigations 78-1 (open-file report), February 1978. 56 p, 13 fig, 1 plate, 10 tab, 20 ref.

Descriptors: *Groundwater resources, *Surface waters, *Aquifer characteristics, *Hydrogeology, *Groundwater availability, Water yield, Irrigation, Water quality, Groundwater recharge, Surface-groundwater relationships, Reservoir storage, Water supply, *Colorado, Custer County, Fremont County.

The Wet Mountain Valley is an intermontane trough filled to a depth of at least 6,700 feet with unconsolidated deposits. Ground water occurs under both artesian and water-table conditions within the basin-fill aquifer and ground-water movement is toward Grape and Texas Creeks.

The depth to the water table is less than 10 feet in an area of about 40 square miles along the central part of the valley and is less than 100 feet in most of the remainder of the valley. Ground water stored in the upper 200 feet of saturated basin-fill sediments is estimated to total 1.5 million acre-feet. Yields greater than 50 gallons per minute generally can be expected from wells in the central part of the basin-fill aquifer, and yields less than 50 gallons per minute are generally reported from wells around the edge of the basin-fill aquifer. Yields of wells in the mountainous areas are generally less than 20 gallons per minute. Most streamflow occurs as a result of snowmelt runoff during June and July. The long-term annual runoff at seven stations ranges from an estimated 0.02 cubic foot per second per square mile to an estimated 1.17 cubic feet per second per square mile, generaly increasing with station altitude. Generalized annyal water budgets for two areas in the Wet Mountain Valley indicate that surface-water outflow is only 7 to 11 percent of the total water supply from precipitation and other sources. The remaining water is lost to the atmosphere by evapotranspiration. The quality of both the surface and ground water is generally within the recommended limits for drinking water set by the U.S. Public Health Service. (Woodard-USGS)
W79-00274

POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT AND VICINITY, FLORIDA, SEPTEMBER, 1977,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00275

TRACING SEWAGE EFFLUENT RECHARGE - TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W79-00299

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUSTRALIA,
Australian Atomic Energy Commission, Lucas Heights, New South Wales (Australia). Isotope Div.
For primary bibliographic entry see Field 2F.
W79-00322

MANAGEMENT ASPECTS OF CYCLIC STORAGE OF WATER IN AQUIFER SYSTEMS,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
H. W. Greydanus.
Water Resources Bulletin, Vol. 14, No. 2, p 477-480, April 1978.

Descriptors: *Aquifer systems, *Water management(Applied), *Water storage, Legal aspects, Water quality, Effects, Legislation, Environmental effects, Energy, Physical impacts, Existing rights, Equitable treatment, Cyclic storage.

Most of California's precipitation falls at the wrong place in the wrong season in relation to water needs. Redistribution and regulation are essential. Aquifer systems-groundwater basins--can provide a share of the future cyclic storage regulation. There are some differences in management concepts in using a full basin in comparison with a partially dewatered basin. Legal water quality, and physical impacts on aquifer systems, including subsidence, are concerns. Legal water quality, and physical impacts on aquifer systems, including subsidence, are concerns. Storage may be for the benefit of overlying water users or for distant areas. Extraction during periods of dryness or recharge methods will require careful planning. Existing rights and uses and equitable treatment of all parties must be assured. Financial compensation may be involved. Changes in methods of operation or degree of self-determination by affected waer agencies will require committed watermanship to resolve. Legislation or amendments to organic acts may be needed, but much can be accomplished within existing statutes. Environmental impacts which can be avoided by not using large surface storage sites are important. Energy for pumping will be a key consideration. About 40 percent of California is underlain by aquifer systems. This resource offers major potential in overcoming in maldistribution of natural water resources. (Bell-Cornell)
W79-00386

HYDROGEOLOGY OF THE GRANDE PRAIRIE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W79-00470

FREE-SURFACE SEEPAGE PROBLEM,
California Univ., Santa Barbara. Dept. of Mathematics.
For primary bibliographic entry see Field 8D.
W79-00496

4C. Effects On Water Of Man's Non-Water Activities

OUR RECLAMATION FUTURE: THE MISSING BET ON TREES,
Southern Illinois Univ. at Carbondale, IL. Dept. of Botany.
W. C. Ashby, C. Kolar, M. L. Guerke, C. F. Pursell, and J. Ashby.
Illinois Institute for Environmental Quality, Document No. 78/04, January 1978. 85 p, 68 fig, 7 tab, 80 ref. 80.057.

Descriptors: *Land reclamation, *Strip mining, *Forestry, *Forest management, *Illinois, *Reforestation, *Land management, Conservation, Soil erosion, Reclamation, Land use, Natural resources, Forests, Recreation, Hardwood, Wind erosion, Water erosion, Habitats, Wildlife conservation, Ecology, Environmental effects, Cultivation, Soil conservation, Erosion control, Legislation, Coniferous trees.

The use of tree planting in reclamation of surface-mined land in Illinois is examined. The history of reclamation in the State from the early tree planting in the 1920's to the present is traced. This is followed by a description of factors involved in growing trees on surface-mined land, including species performance and planting recommendations. Growth characteristics and performance records are discussed for a number of hardwood and conifer species. Consequences of forestation on the environment are extremely favorable. For example, trees act as filters to remove potentially toxic particles from the air, eliminate or reduce wind erosion and water erosion, and improve scenery. The recreational and educational uses of reclaimed surface-mined land are outlined and the predicted needs for recreational land is compared with the potential supply within Illinois. The social and economic effects of reclamation to forest land are discussed in general and also for some specific regions of the State, such as the Chicago area, Western Illinois, and Southern Illinois. A chapter on reclamation legislation and goals for the State is included. The Illinois reclamation laws effective from 1962 to 1975 are summarized. Also, included are a list of references, a reclamation directory giving names and addresses of State officials and reclamation managers, and a glossary of common and scientific names of plants mentioned in the report. (Majtenyi-IPA)
W79-00086

INFLUENCE OF STRIP MINES ON REGIONA GROUND-WATER FLOW,
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00118

GRAZING AND LOGGING EFFECTS ON SO SURFACE CHANGES IN CENTRA COLORADO'S PONDEROSA PINE TYPE,
Rocky Mountain Forest and Range Experime Station, Fort Collins, CO.
P. O. Currie, and H. L. Gary.
Journal of Soil and Water Conservation, Vol 3 No 4, p 176-178, July-August 1978. 2 fig, 1 tab, ref.

Descriptors: *Soil erosion, *Forest soi *Lumbering, *Colorado, On-site investigation Grazing, Vegetation effects, Measurement, Po derosa pine trees, On-site tests, Methodolog Analysis, On-site data collections.

Measurements of soil surface elevation on po derosa pine-bunch lands in central Colora showed that 35 years of grazing and winter loggi had not caused serious erosion. All measuremer indicated an aggradation of soil surface material relation to differences in ground cover, grazi and timber removal. Aggradation on ungraz areas exceeded aggradation on grazed or logg areas by less than 7 millimeters. All logging w done when the soil was dry or frozen. Rubber-tir equipment was used for skidding and decking. extensive permanent road system was not bu Instead, temporary roads with frequent log dec were used. Log butts were raised off the grou for skidding, and work was temporarily suspend whenever midwinter temperatures allowed the s surface to thaw. (Humphreys-ISWS)
W79-00140

SUMMARY OF STUDY FINDINGS, PHASE REPORT: ECOLOGICAL EFFECTS HIGHWAY CONSTRUCTION UPO MICHIGAN WOODLOTS AND WETLANDS,
Michigan State Univ., East Lansing. Dept. Resource Development.
P. B. Davis, and C. R. Humphrys.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-271 94 Price codes: A04 in paper copy, A01 in microfich Journal Article Number 8208, 1975. 63 p.

Descriptors: *Wetlands, *Highway effec *Forests, Highways, Road construction, Effec Ecological distribution, Drainage effects, Mar management, Water pollution sources, Chloride Michigan.

The most important ecological effect on highw construction is the change of natural soil draina conditions. Wetland sites are most affecte Highway facilities may either raise or lower t groundwater table depending on culvert a drainage design. The sites where deep road cuts fills were made experienced a change in wa table levels near the edges of the roadway and creased evapotranspiration rates at the expos woodlot edges. The extent and duration of the altered drainage regimes is unknown. It is possib that they are just temporary and may be correct with time by plant successions if adequate drai and channels have been provided. The vegetati species most sensitive to highway constructi were conifers on the wetland sites. The growth hardwood species on wetland or upland sites w either unaffected or significantly increased. Wa contamination from highway use occurs, b recovery is fairly rapid. Downstream recove usually occurs within 200 feet of the highway. terchanges constitute the greatest threat to wa quality, especially with respect to chloride conce

ration. This is apparently due to the drainage conveyance at these sites. (Steiner-Mass)
W79-00195

LAKE SUPERIOR REGULATION EFFECTS,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
F. H. Quinn.
Water Resources Bulletin, Vol. 14, No. 5, p 1129-1142, October 1978. 8 fig, 2 tab, 7 ref.

Descriptors: *Lake Superior, *Regulation, *Effects, *Great Lakes, *Mathematical models, Water resources development, Planning, Simulation analysis, Water levels, Outflow, Diversion, Equations, Systems analysis, Natural regime, Historical considerations, Hydrologic response.

The outflows of Lake Superior through the St. Marys River have been modified from natural conditions, initially by the construction of engineering works, such as bridges, and later by the construction of control works and the regulation of the lake. For all practical purposes, the period from 1860 to 1887 represents the natural river conditions. During the period 1888-1900, the regimen was modified by the construction of the International Railroad Bridge and the Chandler-Dunbar Power Canal. In 1901, construction began on the compensating works. Following the completion of the compensating works in August 1921, the Lake Superior outflows were regulated in accordance with the Orders of Approval, 26 and 27 May 1914. A hydrologic response model was developed to simulate the natural Lake Superior regime. The model was run for the 1860-1975 period to simulate natural Lake Superior levels and outflows. The simulated levels were compared with the recorded levels to determine the effect of regulation. It was found that regulation has resulted in a rise in Lake Superior water levels. The simulated natural outflows for the period from 1937 to 1975 were run through the Great Lakes hydrologic response model to analyze the regulation effects on Lakes Michigan-Huron, St. Clair, and Erie. The results show no long-term bias due to regulation. (Bell-Cornell)
W79-00388

CHANGES IN WATER REGIME OF BROWN FOREST SOILS OF THE GEORGIAN SSR UNDER THE EFFECT OF SILVICULTURAL PRACTICES, (IN RUSSIAN),
Tiflis Inst. of Forestry (USSR).
T. F. Urushadze, and D. V. Lomidze.
Pochvovedenie (6), p 55-62, 1977.

Descriptors: *Forest soils, Georgian SSR, USSR, *Lumbering, Clear-cutting, Soil physical properties, *Soil moisture, Seasons, Soil, Trees, Soil erosion, *Moisture deficit.

Soils in undisturbed forest plantations (Georgian SSR, USSR) are characterized by better water-physical roperties than soils on sites where logging took place. The loss of soil moisture begins in the 1st half of April; soil moisture accumulation, from the 2nd half of Nov. In summer, under high (tree) density areas, the formation of a thick dead horizon is observed, as compared to the low density sites. With increasing age and density of the tree stand, the loss of soil increases.--Copyright 1978, Biological Abstracts, Inc.
W79-00401

BRUSHLAND WATERSHED FIRE MANAGEMENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 6B.
W79-00449

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS,
Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Department.
B. B. Ross, V. O. Shanholtz, D. N. Contractor, and J. C. Carr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 170, Price codes: A07 in paper copy, A01 in microfiche. Virginia Water Resources Research Center Bulletin 85, October 1978. 137 p, 39 fig, 27 tab, 31 ref. appendix from Center upon request. OWRT A-077-VA(2).

Descriptors: *Watershed model, *Land-use model, *Finite element model, Flood flow routing, *Model studies, Storm water, Surface flow modeling, Parametric model, Watershed subdivision.

A model was developed for predicting storm hydrographs by combining the components of a rainfall excess generator and a stormwater routing routine. The spatially responsive characteristics of this model structure were accomplished by assuming two basic discretization phases. The first phase focused on minimizing the aggregation of the dynamic, hydraulic storage properties in soils and surface conditions. Soils and land-use data defined 'homogeneous' response units; a parametric soil moisture algorithm generated rainfall excess for each unique response unit. Phase two considered the watershed's physiographical properties and developed a finite element structure to route rainfall excess downstream. The governing flow equations of continuity and momentum were solved by the finite element numerical technique. The finite element model structure can be used with input data at either a fine or coarse level of data resolution. Trade-offs exist among such factors as computer costs, data acquisition, and accuracy. Results from applying the model to several watersheds with complex land uses were encouraging. Comparisons with recorded discharge were made in the ungaged context; that is, the data base was created, streamflows were generated, and then were compared to recorded flows with no optimization. Several scenarios are included in the text, each illustrating the utility of the modeling concept for evaluating the impact of land-use alternatives on flood flows.
W79-00450

FACTORS AFFECTING THE QUALITY OF URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00456

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES,
New Hampshire Univ., Durham.
J. A. Pickering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 169, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, May 1978. 81 p, 5 fig, 10 tab, 30 ref, append. OWRT A-038-NH(1), 14-31-0001-4029.

Descriptors: *Economic impact, Hydrologic aspect, Water quality, Economic development, Watershed management, Lakes, Land use, Lake shore development, Water quality, Phosphorus accumulation, Economic-environmental trade-off, Mathematical programming.

Alternative development patterns, evaluated by their impacts on the lake area environment and area economy, included residential patterns, commercial patterns, and combinations of these two types. Economic impact from each alterative development was measured in terms of net public revenue and total private expenditures to the local area, to the state and to other states. The impact of the alternative developments on the lake area environment was measured in terms of crowding levels and the level of phosphorus concentration in the lake. Crowding levels included lake surface use, public beach use and the total number of user days spent in the area. Phosphorus loading of the lake water was used as a proxy variable to reflect the changes in the lake water quality. Eleven development patterns were analyzed. The first pattern was a forested watershed which maximized the environmental quality through low phosphorus loading of the lake and no lake area crowding. Economic revenues accrued from property tax revenues of the undeveloped land holdings. The second alternative described the sample lake's current development status. From the analysis, to ensure good environmental quality, reduce lake crowding and lake nutrient levels, as well as to maintain a given economic criterion, a combination of first tier residential and commercial development around the lake is suggested. Development should be planned to avoid overcrowding residential patterns.
W79-00460

4D. Watershed Protection

OUR RECLAMATION FUTURE: THE MISSING BET ON TREES,
Southern Illinois Univ. at Carbondale, IL. Dept. of Botany.
For primary bibliographic entry see Field 4C.
W79-00086

SOIL, WATER AND AIR SCIENCES RESEARCH.
Science and Education Administration, Washington, DC.
For primary bibliographic entry see Field 2G.
W79-00105

GRAZING AND LOGGING EFFECTS ON SOIL SURFACE CHANGES IN CENTRAL COLORADO'S PONDEROSA PINE TYPE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 4C.
W79-00140

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUNTAINOUS BASIN,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W79-00332

HYDRAULIC MODEL INVESTIGATION OF A TWO-WAY DROP INLET FOR FLOODWATER RETARDING STRUCTURE NO. 3, BANKLICK CREEK WATERSHED, BOONE AND KENTON COUNTIES, KENTUCKY,
Department of Agriculture, Minneapolis, MN. Science and Education Administration.
For primary bibliographic entry see Field 8B.
W79-00341

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTED WATERSHED,
Kentucky University, Lexington, Water Resources Research Institute.
For primary bibliographic entry see Field 5B.
W79-00448

BRUSHLAND WATERSHED FIRE MANAGEMENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 6B.
W79-00449

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,
Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.
K. Cartwright, S. A. Specht, R. H. Gilkeson, and R. A. Griffin.
Available from the National Technical Information, Springfield, VA 22161 as PB-287 737, Price codes: A03 in paper copy, A01 in microfiche. University of Illinois, Water Resources Center, Urbana, Research Report No 135, (UILU-WRC-78-0135), August 1978. 27 p, 9 fig, 4 tab, 2 ref. OWRT A-084-ILL(1).

Descriptors: *Chemical properties, *Groundwater, Radioactivity, Radioisotopes, Sediments, Solubility, Sulfates, Water supply, *Illinois, Geology, *Aquifer characteristics, Barite, *Barium, *Radium, Thorium, Uranium, *Pollutant identification.

Analyses of water from municipal wells in Illinois by the Illinois Environmental Protection Agency showed that more than 300 wells exceeded the upper limit, 3 picocuries/liter (U.S. Public Health Service, 1962), for gross alpha radiation in drinking water. More than 30 wells exceeded the upper limit, 1 milligram/liter (U.S. Public Health Service, 1962), for barium in drinking water. High levels of radiation in ground water were more extensive in areal distribution than the high levels of barium. All of the affected wells were finished in bedrock, primarily in rocks of the Cambrian and Ordovician systems of northern Illinois. The geologic setting in which the high levels of radiation and barium were documented indicated that the problem was not restricted to Illinois. The source of the radiation in ground water was thought to be the natural occurrence of the radioactive elements uranium-238 and thorium-232 in the aquifer rocks. Analyses of a limited number of rock samples indicated that uranium and thorium concentrations were highest in fine-grained sediments in the aquifer system; the highest concentration was in shales that confine the aquifer. The occurrence of natural radioisotopes in ground water was thought to be complex, involving source rocks, ground-water chemistry, and the hydraulic stress placed on the aquifer. Chemical analyses of rock samples indicated that high concentrations of barium were widespread in rocks of the Cambrian and Ordovician Systems. The concentration of barium in ground water was controlled by solubility equilibria reactions with sulfate ion. A map showing sulfate ion concentration in the Cambrian Ordovician Aquifer could be used to delimit regions where barium might occur at concentrations exceeding 1 milligram/liter.
W79-00003

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5B.
W79-00006

DEVELOPMENT OF A MANOMETRIC FISH BIOASSAY TECHNIQUE FOR WATER POLLUTION,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
D. R. Bledsoe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 657, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, December 1977. 116 p, 20 fig, 54 tab, 27 ref, append. OWRT A-034-TENN(2).

Descriptors: *Bioassay, Fish populations, *Lethal limit, Toxicity limits, *Pollutant identification, Respiration rates, Goldfish, Rainbow trout, Carp, Channel catfish, *Tissue bioassay, *Bioassay techniques.

Static 96-hour in vitro bioassays were conducted to determine the median toxicity limit (TLm) of zinc sulfate, phenol, and isopropyl alcohol for common goldfish (Carassius auratus). Respirometric in vivo bioassays were conducted utilizing the same three toxicants; liver tissue homogenates from channel catfish (Ictalurus punctatus), rainbow trout (Salmo gairdneri), and carp (Cyprinus carpio) were utilized as the bioassay test subjects. Oxygen utilization by the tissue homogenates subjected to various concentrations of toxicants was the recorded response. Comparisons between the two bioassay techniques revealed that the respirometric median toxicity limit (RTLm) was closely correlated to the TLm values for each of the toxicants studied. The RTLm was defined as the toxicant concentration at which the slope of the line of the oxygen utilization per gram of liver tissue homogenate versus toxicant concentration was equal to that of homogenate not subjected to a toxicant. (Bustamante-Tenn Tech)
W79-00008

IS CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER.,
Illinois Univ. at the Medical Center, Chicago.
W. H. Hallenbeck, E. H. Chen, C. S. Hesse, K. Patel-Mandik, and A. H. Wolff.
Journal of the American Water Works Association, Vol. 70, No. 2, p 97-101, February 1978. 2 fig, 8 tab, 21 ref.

Descriptors: *Asbestos, *Potable water, *Electron microscopy, *Rain, Air pollution effects, Water pollution sources, *Pollutant identification, Sampling, *Chrysotile, *Carcinogenesis, Analysis, *Asbestos-cement pipe, *Lake Michigan, *Illinois.

To investigate the possibility that asbestos-cement pipe does, as has been suggested, release asbestos as a contaminant in drinking water, a study was made of water samples from fifteen public water-supply systems before and after their flow through asbestos-cement pipes of various ages, lengths, and diameters. Although several water systems contained moderately aggressive water, no statistically significant release of chrysotile was observed. It may be possible, however, that chrysotile is released from pipes at levels below the detection limits used in this study or at levels that were obscured by laboratory contamination or by chrysotile already present in the water.
W79-00013

DETERMINATION OF CHRYSOTILE ASBESTOS IN RAINWATER,
Illinois Univ. at the Medical Center, Chicago.
C. S. Hesse, W. H. Hallenbeck, E. H. Chen, and G. R. Brenniman.
Atmospheric Environment, Vol 11, p 1233-1237, 1977. 4 tab, 30 ref. OWRT A-071-ILL(6).

Descriptors: *Asbestos, *Electron microscopy, *Rain, Pollutant identification, Air pollution effects, Water pollution sources, *Chrysotile, *Carcinogenesis, Analysis, Chicago, *Illinois.

A feasibility study was undertaken in order to determine if chrysotile asbestos could be found in rainwater. Rainwater samples were collected at one Chicago and two suburban Chicago locations. The Chicago location was near a busy intersection and building construction. The two suburban stations were located in residential areas. All three sites were within four blocks of a major expressway. None of the rainwater samples collected at the suburban sites contained levels of chrysotile which were significantly above laboratory contamination levels. All the rainwater samples from the Chicago location contained significant levels of chrysotile. This finding demonstrates a mechanism by which asbestos could be transferred from air to surface water.
W79-00014

AQUATIC BIOTAL MONITOR,
Tereco Corp., College Station, TX. (Assignee).
W. E. Pequegnat.
U.S. Patent No. 4,084,543, 10 p, 12 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 890, April 18, 1978.

Descriptors: *Pollutant identification, *Patents, *Monitoring, *Water pollution effects, *On-site investigations, Biota, Water quality, Sampling, Equipment.

An aquatic biotal monitor is disclosed for monitoring the chronic impact of pollution, such as chemical, thermal and turbidity, of aquatic environments upon in situ samples of biota. The monitor includes a top and bottom mounting ring. A water permeable mesh extends between and interconnects the mounting rings and enclosed the bottom ring to form a closed and cylindrical enclosure to retain the biotal sample. The cylindrical enclosure permits the free exchange of ambient water between the outside of the cylindrical enclosure and the inside of the enclosure. The monitor further includes flotation structure attached to the top ring for floating the enclosure in the body of water so that the enclosure monitors the impact of changing aquatic environments on the biotal sample. In addition, the monitor can be anchored at a selected site for studying the impact over periods of time. (Sinha-OEIS)
W79-00033

REMOTE WATER MONITORING SYSTEM,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
For primary bibliographic entry see Field 7B.
W79-00047

AUTOMATIC SYSTEM CLEANER FOR REMOTE MONITOR,
J. D. Hilty.
U.S. Patent No. 4,088,575, 6 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 636, May 9, 1978.

Descriptors: *Patents, *Monitoring, *Sampling, *Water treatment, *Water quality control, *Remote sensing, Slime, Algal poisoning, Equipment protection.

A problem commonly encountered, particularly in warm weather, is that continuing biological activity occurring in water being sampled causes the sample which is monitored remotely to be not truly representative of the water at the instant the water was removed from the lake or stream. A further problem is that the continuing biological activity produces a biological slime which grows on all surfaces contacted by the water being sampled. Such disadvantages are removed by providing an automatically timed apparatus for periodically introducing a biological poison to the water being sampled immediately as the sample is being withdrawn from its source. The periodic introduction of the biological poison functions as a complete system protector to keep all exposed sur-

faces throughout the monitoring system free of slime accumulations. Backwashing means are also provided to preserve the cleanliness of the mechanism which pumps the water being sampled to monitoring devices and operates to enhance the effectiveness of the monitoring and sampling devices. (Sinha-OEIS)
W79-00051

QUANTITATIVE COMPARISON OF SEINING AND UNDERWATER OBSERVATION FOR STREAM FISHERY SURVEYS,
Argonne Natonal Lab. IL.
For primary bibliographic entry see Field 7B.
W79-00072

CONTINUOUS STANDARD WATER DELIVERY SYSTEM FOR BIOASSAYS WITH AQUATIC ORGANISMS,
Rijksinstituut voor Drinkwater-voorziening, Leidschendam (Netherlands).
W. Slooff, E. Rab, and T. P. Spierenburg.
The Progressive Fish Culturist, 1978, Vol. 40(3), p 112-114, 2 fig, 4 ref.

Descriptors: *Bioassay, Methodology, Laboratory tests, Laboratory equipment, Water pollution effects, *Water quality, Monitoring, *Water chemistry, Water treatment, Waste treatment, *Water purification dosing apparatus.

The effects of pollutants on aquatic organisms can only be determined in a test water of acceptable quality. In this paper we describe a reliable automatic system which removes most of the undesirable contaminants from the water and adds the proper amounts of certain reconstituting chemicals for the production of uniform test water necessary for reliable and reproducible toxicity test results. (EIS-Katz)
W79-00073

ARTIFICIAL SUBSTRATE SAMPLER FOR BENTHIC INVERTEBRATES IN PONDS, SMALL LAKES, AND RESERVOIRS,
Tennessee Technological Univ., Cookville. Dept. of Biology.
For primary bibliographic entry see Field 7B.
W79-00074

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET,
Food and Drug Administration, Washington, DC. Div. of Chemistry and Physics.
A. P. Borsetti, and J. A. G. Roach.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 241-247, 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Degradation(Decomposition), *Mullets, Path of pollutants, Pesticides, Pesticide kinetics, Gas chromatography, Soil chemistry, Soil analysis, Chemical analysis, Organic compounds, Chemical properties, Chemical wastes, Industrial wastes, Persistence, *Kepone, *Tissue analysis.

The insecticide Kepone has been the subject of intensive residue analyses following recent environmental contamination from Kepone production in Hopewell, VA. The finding of Kepone homologs in soil and fish (mullet) reported here may suggest a possible pathway for the environmental degradation of this highly persistent pesticide, and may indicate the presence of residue components in addition to Kepone per se that should be considered for inclusion in analyses. (EIS-Deal)
W79-00080

A METHOD OF MEASURING BACTERIAL GROWTH IN AQUATIC ENVIRONMENTS USING DIALYSIS CULTURE,
Texas Tech Univ., Lubbock. Dept. of Microbiology.
R. C. Baskett, and W. J. Lulves.
J Fish Res Board Can. 31(3), p 372-374, 1974.

Descriptors: Aquatic environments, Bacterial growth, Brevibacterium sp, Culture, Dialysis, Environment, Farm ponds, *Growth rates, Nutrients, Ponds, Methodology, Measurement.

An inexpensive, easy-to-use method was developed for studying microbial growth and behavior in situ. Dialysis tubing suspended from a styrofoam flotation ring was filled with sterile distilled water, placed in a farm pond, and inoculated with Brevibacterium sp. The visible population within the tubing increased significantly within 96 h, indicating that nutrients in the pond water necessary for growth and multiplication of Brevibacterium sp. diffused through the dialysis membrane. Copyright 1974, Biological Abstracts, Inc.
W79-00109

ACID PRECIPITATION IN THE NETHERLANDS,
Department of Environmenta Control, Haarlem (Netherlands).
A. J. Vermeulen.
Environmenta Science and Technology, Vol. 12, No. 9, p 1016-1021, September 1978. 4 fig, 2 tab, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Air pollution, *Europe, Sulfur compounds, Nitrogen compounds, Rain water, Acids, Pollutants, Foreign countries, Water quality, Air pollution effects, *The Netherlands, Acid precipitation.

Various tests of the chemical composition of precipitation indicate that acids are present in larger quantities than would occur naturally. This phenomenon is attributed to ever increasing sulfur dioxide and nitrogen oxides air pollution. Around 1966, the highest acid precipitation measurements in the world (on a yearly basis) were made in The Netherlands. After 1967, the acid concentrations of rain decreased, simultaneously with a considerable reduction in SO2 emissions. The coming years in The Netherlands will be characterized by a decreasing use of natural gas and an increasing use of oil with this consequence: an increasing emission of SO2. Acid deposition may increase from an average of 140 mg/sq m (expressed as H(+)) in the year 1985 (with high extreme values of 300 mg/sq m) to an average of 370 mg/sq m in the year 2000 (with high extreme values of 700 mg/sq m). The natural background deposition would be about 1-3 mg/sq m per year. The total effects of such an acidification of precipitation cannot be predicted at present. (Humphreys-ISWS)
W79-00138

CONTROLLING AND MONITORING ACTIVATED-SLUDGE UNITS,
Polybac Corp., New York.
For primary bibliographic entry see Field 5D.
W79-00160

WATER ANALYTICAL DATA AS A TOOL IN DRILLING AND PRODUCTION ECONOMICS,
For primary bibliographic entry see Field 8G.
W79-00168

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 2. BACTERIA AS AN INDEX OF WATER POLLUTION ON THE RYBI POTOK STREAM,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
For primary bibliographic entry see Field 5C.
W79-00219

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.
Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Management.
For primary bibliographic entry see Field 5G.
W79-00222

ION SELECTIVE ELECTRODES IN WATER QUALITY ANALYSIS,
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
R. C. Thurnau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 724, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/2-78-106, May 1978. 37 p, 18 fig, 10 tab, 54 ref.

Descriptors: *Pollutant identification, *Water analysis, *Water quality, *Ions, *Electrodes, *Specific ion electrode, *On-site laboratories, Sampling, Monitoring, Hydrogen ion concentration, Alkalinity, Calcium, Chloride, Fluoride, Water hardness, Nitrate.

A mobile water quality laboratory capable of monitoring 19 water quality parameters is described. Among the instruments included in this laboratory, ion specific electrodes have shown great potential, especially for monitoring such parameters as alkalinity, calcium, chloride, fluoride, hardness, nitrate, and pH. The operating principle for all specific ion electrodes is based on creation of a classical concentration potential across a permeable membrane, that is, it follows the Nernst equation. The pH and chloride electrodes were housed in a commercial unit and linked to the computer with a minimum number of operating problems. Other parameters required more development and required ionic strength or pH buffers to swamp out problems of activity and ionic strength. Test periods usually lasted about one week. The electrodes functioned quite well with accuracy comparable to statistics found in Standard Methods for the Examination of Water and Wastewater. (Majtenyi-IPA)
W79-00223

ASBESTOS - A BIBLIOGRAPHY,
Environmental Research Lab.-Duluth, MN.
J. H. Tucker, P. M. Cook, G. L. Phipps, G. N. Stokes, and P. H. Lima.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 486, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/3-78-066, July 1978, 92 p.

Descriptors: *Asbestos, *Bibliographies, *Air pollution, *Air pollution effects, Chemical properties, Physical properties, Toxicity, Environment, Biological properties.

The 1,425 references included in this bibliography are related to the chemical, physical, biological, and medical properties and effects of asbestos in the environment. The basic list was compiled from bibliographies supplied by A. Brown, Mayo Clinic, Rochester, MN; R. E. Shapiro, NIEHS, Silver Spring, MD; and J. R. Kramer, McMaster University, Hamilton, Ont., Canada. This was supplemented by handsearching Biological Abstracts and Chemical Abstracts 1960-1975 and by ASCA computer searches for the years 1973-1977. (Majtenyi-IPA)
W79-00225

ANALYSIS OF RADIOACTIVE CONTAMINANTS IN BY-PRODUCTS FROM COAL-FIRED POWER PLANT OPERATIONS,
Environmental Monitoring and Support Lab., Cincinnati, OH.
H. Krieger, and B. Jacobs.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 365, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-78-039, July 1978. 31 p, 7 fig, 3 tab, 13 ref, 1 append.

Descriptors: Pollutant identification, *Environmental pollution, *Air pollution, *Radioactive wastes, *Radioisotopes, *Electric powerplants, *Coals, Fossil fuels, Uranium, Radium, Thorium, *Radiochemical analysis, Radiation, Public health, Fly ash, Scrubber sludge, Spectrometry.

In addition to the sulfur and nitrogen oxides commonly associated with environmental discharges of coal-fired plants, significant concentrations of naturally radioactive contaminants are produced, including compounds of radium, thorium, and uranium. A study was conducted to identify and quantify the major radionuclides detected in fossil fuel powerplant discharges. Samples of coal, fly ash, bottom ash, and scrubber sludge were collected from different regions of the U.S. and analyzed for radium, thorium, and uranium. Standard radiochemical procedures were modified to obtain reproducible results for the variety of samples analyzed. These can be used to calculate a radioactivity balance on the basis of normal plant operations. The spectrum of activity levels is tabulated in a variety of samples and compared with the results from non-destructive spectrometry and radiochemical separations. It is concluded that, for the present, the expanding fossil-fuel powerplant operations present no radiation hazard. Methods of analysis are described in the appendix. (Majtenyi-IPA)
W79-00227

YELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969.
Environmental Protection Agency, Kansas City, MO. Region VII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 664, Price codes: A16 in paper copy, A01 in microfiche. December 1970. 352 p.

Descriptors: *Yellowstone National Park, *Soda Butte, *Water pollution, *Water quality, *Missouri River, *Yellowstone River, National Parks, Wyoming, Missouri, Montana, North Dakota, Organic loading, Basic data collections, Biochemical oxygen demand, Ammonia, Nitrates, Nitrogen, Sulfates, Water temperature.

Basic data from the Yellowstone National Park water quality survey of May-August 1970 and the Soda Butte survey of May-October 1969 are presented in tables; no text is included. Indicators monitored were water temperature, air temperature, streamflow, dissolved oxygen, pH, conductivity, turbidity, hardness, chloride, sulfate, BOD, ammonia, total Kjeldahl nitrogen, nitrite- and nitrate-nitrogen, orthophosphorus, calcium, sodium, potassium, fluoride, boron, copper, iron, manganese, zinc, selenium, radium-226, magnesium, barium, lead, cyanide, arsenic, phenols, residue, uranium, silica, total organic carbon, coliforms, fecal coliforms, and streptococci. Various rivers were monitored, including the Missouri and Yellowstone. (Lynch-Wisconsin)
W79-00250

GROUNDWATER QUALITY ATLAS OF NEBRASKA,
Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln.
For primary bibliographic entry see Field 7C.
W79-00252

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI,
Geological Survey, Rollo, MO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00254

HYDROGEOLOGIC RECONNAISSANCE OF THE MEKONG DELTA IN SOUTH VIETNAM AND CAMBODIA,
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00255

AUTOMATED DETERMINATION OF SELENIUM IN WATER,
Geological Survey, Denver, CO. Water Resources Div.
G. Pyen, and M. Fishman.
Atomic Absorption Newsletter, Vol. 17, No. 2, p 47-48, March-April 1978. 1 fig, 2 tab, 3 ref.

Descriptors: *Water analysis, *Chemical analysis, *Trace elements, *Analytical techniques, *Laboratory tests, *Selenium, Atomic absorption spectrometer.

An automated method to determine both inorganic and organic forms of selenium in water is described. Organic selenium-containing compounds are first manually decomposed by hydrochloric acid-potasssium persulfate digestion. The selenium liberated, with inorganic selenium originally present, is reduced to selenite with stannous chloride and potassium iodide and then to hydrogen selenide with sodium borohydride. The hydrogen selenide is stripped from the solution with the aid of nitrogen and is then decomposed in a tube furnace heated to 800 degrees C. Selenium concentrations are determined by an atomic absorption spectrometer. Thirty samples per hour can be analyzed to levels of 1 microgram selenium per liter.
W79-00261

LABORATORY STUDIES OF GAS TRACERS FOR REAERATION,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
R. E. Rathbun, D. W. Stephens, D. J. Shultz, and D. Y. Tai.
ASCE Proceedings, Journal of the Environmental Engineering Division, Vol. 104, No. EE2, Paper 13679, p 215-229, April 1978. 6 fig, 3 tab, 23 ref, 2 append.

Descriptors: *Reaeration, *Tracers, *Gases, Laboratory tests, Least squares method, Oxygenation, Absorption, Evaluation, Hydrocarbon gases, Reaeration coefficient, Nonlinear least squares.

Laboratory studies were conducted to determine the rates at which ethylene and propane desorbed from a water bath relative to the rate at which oxygen was absorbed by the same water. The ratios between the oxygen absorption coefficient and the hydrocarbondesorption coefficient were 1.15 and 1.29 for ethylene and propane, respectively. These ratios, which were independent of mixing conditions within the water and independent of water temperature over the range of 20 to 30 degrees C, serve as the basis for a tracer technique for measuring reaeration coefficients of streams. Nonlinear least squares procedures were used in the analysis of the concentration as a function of time data. Comparison of 2-parameter and 3-parameter procedures showed that the 3-parameter procedure was able to fit the data better in terms of a foot-mean-square error. However, estimats of the saturation concentration for dissolved oxygen with the 3-parameter procedure were unrealistic. Therefore, a 2-parameter procedure with the saturation concentration fixed at a literature value for the specific temperature and corrected for barometric pressure was used. The 2-parameter procedure was also used for the hydrocarbon data with the quilibrium concentration fixes at zero.
W79-00270

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00271

CRITERIA DOCUMENT FOR DDT.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 014, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-440/9-76-010, 150 p, June 1976. 7 tab, 5 app, 92 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide kinetics, DDE, DDD, Chemical degradation, Animal pathology, Toxicity, Mortality, Pesticides, Organic compounds, Environmental effects, Path of pollutants, Chemical analysis, Chemical properties, Physicochemical properties, Water analysis, Water quality, Public health, Pesticide residues, Food chains, Aquatic life, *Bioaccumulation, *Tissue analysis, *Carcinogens.

This document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of DDT, with emphasis on aquatic behavior. From these data criteria are developed for protection of aquatic organisms and for human exposure. (EIS-Deal)
W79-00276

SAMPLING AND MODELING OF NON-POINT SOURCES AT A COAL-FIRED UTILITY,
Research Corp. of New England, Wethersfield, CT.
For primary bibliographic entry see Field 5B.
W79-00279

CRITERIA DOCUMENT FOR TOXAPHENE.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 677, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-440/9-76-014, June 1976. 63 p., 6 tab, 77 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide kinetics, Animal pathology, Environmental effects, Pesticides, Organic compounds, Path of pollutants, Chemical degradation, Toxicity, Mortality, Pesticides, Physiochemical properties, Chemical properties, Chemical analysis, Aquatic life, Water quality, Public health, Food chains, Pesticide residues, *Toxaphene, *Bioaccumulation, *Tissue analysis.

This document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of Toxaphene, with emphasis on aquatic behavior. From these data a criterion for the protection of aquatic life and human health is developed. (EIS-Deal)
W79-00281

CRITERIA DOCUMENTS FOR ALDRIN/DIELDRIN.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 012,

Price codes: A05 in paper copy, A01 in microfiche. Report EPAc440/9-76-008, 93 p, June 1976. 6 tab, 2 app., 94 ref.

Descriptors: *Aldrin, *Dieldrin, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide kinetics, *Pesticide residues, Physiochemical properties, Chemical properties, Chemical analysis, Water analysis, Water quality, Public health, Toxicity, Mortality, Path of pollutants, Environmental effects, Animal pathology, Fish physiology, Animal metabolism, Food chains, *Bioaccumulation, *Tissue analysis, *Carcinogens.

This document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of Aldrin/Dieldrin, with emphasis on aquatic behavior. From these data, criteria are developed for the protection of aquatic life and for human exposure. (EIS-Deal)
W79-00282

PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS - OPTICAL BRIGHTENERS, METHYL CHLOROFORM, TRI-CHLOROETHYLENE, TETRACHLOROETHYLENE AND ION EXCHANGE RESINS,
Franklin Inst. Research Labs., Philadelphia, PA. Science Information Services Dept.
F. D. Kover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 910, Price codes: A13 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, Office of Toxic Substances, Report EPA-560/2-75-002, 286 p, July 1975. 30 fig, 33 tab, 1 app, 155 ref.

Descriptors: *Resins, *Chemical analysis, *Solvents, *Ion exchange resins, Organic compounds, Physiochemical properties, Chemical properties, Public health, Environmental effects, Chemical wastes, Industrial wastes, Optical properties, Animal physiology, Human pathology, Toxicity, Path of pollutants, *Optical brighteners, Bioaccumulation, Tissue analysis, *Carcinogens, *Mutagens, *Teratogens.

A comprehensive review of the literature published from 1953 through 1973 was conducted to prepare this preliminary investigation report on the physical and chemical properties of optical brighteners, methyl chloroform, trichloroethylene, tetrachloroethylene and ion exchange resins, on environmental exposure factors related to their consumption and use, on the health and environmental effects resulting from exposure to these substances and on any applicable regulations and standards governing their use. (EIS-Deal)
W79-00283

A PERIPHYTIC MICROFLORA ANALYSIS OF THE COLORADO RIVER AND MAJOR TRIBUTARIES IN GRAND CANYON AND VICINITY,
Northern Arizona Univ. Flagstaff. Dept. of Biological Science.
D. B. Czarnecki, D. W. Blinn, and T. Tompkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 761, Price codes: A06 in paper copy, A01 in microfiche. Grand Canyon National Park, Colorado River Research Program Report No. CRRP-06, 106 p, June 1976. 26 tab, 48 ref.

Descriptors: *Periphyton, *Oligotraphy, *Colorado River, Cyanophyta, Chlorophyta, Rhodophyta, Water quality, Ecosystems, Diatoms, Microorganisms, Aquatic algae, Trophic level, Colorado River basin, Bioinicators, Seasonal, Colorado, *Species diversity, Grand Canyon National Park.

A periphytic microflora analysis was conducted seasonally at selected sites on major tributaries and at locations along the Colorado River in Grand Canyon National Park. A reltively high algal diversity was displayed yieling 345 taxa. The high diversity in combination with the overall scaricity of pollution tolerant species indicates a fairly young and possibly oligotrophic system. Major differences in taxa exist above and below Glen Canyon Dam. Based on ecological preferences of major taxa, the Colorado River can be considered to be a high alkalinity and conductivity system. (EIS-Deal)
W79-00285

LABORATORY STUDY OF THE RELEASE OF PESTICIDE AND PCB MATERIALS TO THE WATE COLUMN DURING DREDGING AND DISPOSAL OPERATIONS,
Envirex, Inc., Milwaukee, WI.
R. Fulk, D. Gruber, and R. Wullschleger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 685, Price codes: A06 in paper copy, A01 in microfiche. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Report No. D-75-6, 112 p, December 1975. 10 fig, 43 tab, 4 app. 25 ref.

Descriptors: *Dredging, *Bottom sediments, *Pesticide residues, Chemical analysis, Water analysis, Pesticides, Polychlorinated biphenyls, Organic compounds, Dieldrin, DDT, Chlorinated hydrocarbon pesticides, Aldrin, Oil, Path of pollutants.

Sediments, Water column water, and interfacial water samples were obtained from dredged areas. Samples were analyzed for pesticide materials, PCB, oil and grease, total organic carbon, and silt and clay fraction. Measureable amounts of PCB were found in almost all samples. Of the pesticides, dieldrin and DDT compounds were the most common. Aldrin and 2,4-D esters were present in a few samples. No correlation was found between the amount of TOC, oil and grease, and silt and clay fraction, and the sediment PCB content or the interstitial water PCB content. (EIS-Deal)
W79-00286

MANUAL OF ANALYTICAL QUALITY CONTROL FOR PESTICIDES AND RELATED COMPOUNDS IN HUMAN AND ENVIRONMENTAL SAMPLES,
Lafayette Coll., Easton, PA. Dept. of Chemistry.
J. Sherma.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 019, Price codes: A13 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, Health Effects Research Laboratory, Report EPA-600/1-76-017, February 1976. 290 p., 63 fig, 21 tab, 381 ref.

Descriptors: *Pesticide kinetics, *Chemical analysis, Gas chromatiography, Pesticides, Laboratory tests, Analytical techniques, Bioassay, Pesticide residues, Polychlorinated biphenyls, Chemical degradation, Chemical properties, Path of pollutants, Quality control, Testing procedures, Methodology, *Tissue analysis.

This manual primarily provides the pesticide chemist with a systematic protocol for the prevention and control of analytical procedures which arise in the analysis of human or environmental media. The sections dealing with inter- and intralaboratory quality control, the evaluation and standardization of materials used, and the operation of the gas chromatograph are intended to highlight and provide advice in dealing with many problems which constantly plague the pesticide analytical chemist. Techniques for confirming the presence or absence of pesticides in sample materials are treated, at some length. This highly important area provides validation of the data obtained by the more routine analytical procedures. Last, but by no means least in importance is a short dissertation of the value and need for systematic training programs for pesticide chemists. (EIS-Deal)
W79-00287

MULTIMEDIA LEVELS--MERCURY,
Battelle Columbus Lab., Columbus, OH.
For primary bibliographic entry see Field 5B.
W79-00291

TRACING SEWAGE EFFLUENT RECHARGE - TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. R. Schultz, J. H. Randall, L. G. Wilson, and S. N. Davis.
Paper presented at The Third National Ground Water quality Symposium, Las Vegas, Nevada, September 15-17, 1976. 8 p, 6 fig, 2 tab, 24 ref. OWRT A-063-ARIZ(2), 14-34-0001-7006.

Descriptors: *Sewage effluents, *Gas chromatography, Recharge, Water pollution sources, Pollutant identification, *Tracers, Ground-water contamination.

Dry washes or river beds are often used by southwestern communities to dispose of treated sewage effluent. Because many of these communities rely on ground water as a water supply, there is concern that this disposal practice may contaminate local aquifers. This has led to implementation of monitoring and tracing programs to quantify effluent and ground-water interactions and to development of efficient, easily used predictive models. The treated sewage effluent from the City of Tucson treatment plant has historically been used for irrigation and/or discharged to the normally dry Santa Curz River. Numerous sampling programs have been undertaken to quantify the chemical quality, temperature, and microbiological activity of the ground water in the area ner the Santa Cruz. Ground-water regions with high chloride and nitrate concentrations tend to be associated with areas irrigated with sewage effluent. Quality degradation due to channel recharge is not as evident because the effluent recharge is restricted by fine materials plugging the channel deposits. Recharging water tends to mound near the contact between the Recent and Fort Lowell formations spreading laterally more rapidly than downward. A new tracer, trichlorofluoromethane (trade name Freon 11, Cl3CF) with applications similar to environmental tritium is being evaluated. Cl3CF enters the hydrologic cycle when it is partioned between the gas and liquid phases during raindrop formation. Cl3CF in water samples is separated and quantitatively measured by a gas chromatograph with pulsed electron-capture detector.
W79-00299

PCB IN WATER, A BIBLIOGRAPHY, VOLUME 3.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 928, Price codes: A09 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 78-203, July 1978. 73 p, 3 apend.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, DDT, Organic compounds, *Bibliographies, Path of pollutants, Pesticide residues, *Pollutant identification, Toxicity, Water pollution effects.

This report, containing 206 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volume 1 and 2 (see W73-06501 and W72-04439) cover information announced in SWRA from October 1968 to October

1975. Volume 3 covers the period from November 1975 to April 1978. Author and subject indexes are included.
W79-00305

OPTICAL CLASSIFICATION OF NATURAL WATERS,
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
For primary bibliographic entry see Field 2L.
W79-00318

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION,
Norsk Inst. for Vannforskning, Blindern.
R. F. Wright, and A. Henriksen.
Limnology and Oceanography, Vol. 23, No. 3, p 487-498, May 1978. 8 fig, 3 tab, 33 ref.

Descriptors: *Lakes, *Water chemistry, *Surveys, *Acidic water, Chemical analysis, Ions, Hydrogen ion concentration, Chemicals, Geology, Precipitation(Atmospheric), Surface waters, Weathering, Salts, Acids, Air pollution, Water pollution, Limnology, Acid precipitation.

The concentrations of major ions were determined in 155 representative, small, pristine lakes in southern Norway. The chemistry of these lakes appears to be governed by three factors: atmospheric inputs of seawater salts supply most of the Cl and Na; acid precipitation supplies most of the S94 and H(+); and terrestrial inputs of chemical weathering products account for most of the Ca, Mg, and HC03. The interaction of acid precipitation and geologic environment largely explains pH levels in these lakes. Lakes in granitic terrains have low concentrations of major ions, low buffer capacities, and are often acidic (pH less than 5) when located in areas subject to acid precipitation. Sulfate is the major anion. Lakes in granitic terrains that do not receive highly acidic precipitation have pH levels greater than 5.5, and bicarbonate is the major anion. (Sims-ISWS)
W79-00321

HYDROGEOCHEMISTRY OF A CALCRETE-CONTAINING AQUIFER NEAR LAKE WAY, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 2F.
W79-00323

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS,
Harbor Branch Foundation, Inc., Fort Pierce, FL.
C. F. Zimmermann, M. T. Price, and J. R. Montgomery.
Estuarine and Coastal Marine Science, Vol. 7, No. 1, p 93-97, July 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Pore water, *Sampling, *Instrumentation, *Laboratory tests, Nutrients, Testing, Methodology, Estuaries, Sediments, Ammonia, Phosphates, Nitrates, Nitrites, Silica, Porous ceramic samplers, Porous Teflon samplers.

A laboratory comparison study of porous Teflon and porous ceramic samplers which can be used to collect sediment pore water was performed for varying concentrations of NH4, PO4, NO3, NO2 and Si. Significant differences were evident between nutrient concentrations before and after being filtered through ceramic samplers. Mean per cent recoveries were 11% + or - 0.9 for NH4, 43% + or - 1.1 for PO4, 96% + or - 0.1 for NO3, 85% + or - 0.0 for NO2, and 111% + or - 0.2 for Si (standard deviations for N = 5). Per cent recoveries using the Teflon sampler were from 98-106% for all nutrients tested. The Teflon samplers can be placed in shallow estuarine sediments and samples collected over a 14-day without disturbing the sediment or clogging the sampler. With minor modifications, the sampler can be used to analyze salinity, chlorinity, and trace metals as well as nutrients in pore waters and would be especially valuable when frequent sampling at the same depth and location may be necessary over an extended period of time (i.e., diurnal or tidal studies). (Humphreys-ISWS)
W79-00325

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Nriagu, and R. D. Coker.
Tellus, Vol. 30, No. 4, p 365-375, August 1978. 5 fig, 3 tab, 26 ref.

Descriptors: *Sulfur, *Precipitation(Atmospheric), *Great Lakes, *Great Lakes region, Surveys, Sampling, Isotope studies, Sulfur dioxide, Air pollution, Seasonal Spatial distribution, Temporal distribution, Pollutants, Water pollution, Water pollution sources, *Great Lakes Basin.

By monitoring both the isotope ratio variations and the concentrations of sulfur in bulk precipitation samples, the seasonal changes in the relative contributions of airborne sulfur from bacteriogenic and anthropogenic sources were assessed. Although the delta 34S values during the winter months are generally higher than those of the summer months by about 4 parts per thousand, there is no corresponding seasonal variability in sulfur concentrations. In general, the average SO2 concentrations at urban stations are also higher during the winter months. Precipitation samples at urban sites usually have higher sulfur contents and are enriched in 34S compared to samples at rural and remote locations. On the basis of these observations, it was suggested that the bacteriogenic sulfur emissions within the basin may account for 10-30% of all the sulfur emitted in the basin. The data suggested that the biogenic release of sulfur from land areas may be smaller than the figures employed in many models of the global sulfur cycle. (Sims-ISWS)
W79-00339

MODELING AND MONITORING OF TOXIC SPILLS AND TOXIC EFFLUENTS,
Research Corp. of New England, Wethersfield, CT.
For primary bibliographic entry see Field 5B.
W79-00343

WASTEWATER ODOR PROBLEM SOLVING -- PROCESS MODIFICATION VERSUS AIR TREATMENT,
Research Corp. of New England, Wethersfield, CT.
For primary bibliographic entry see Field 5D.
W79-00373

FACTORS INFLUENCING INDUCED AIR FLOTATION,
Petrolite Corp., St. Louis, MO.
For primary bibliographic entry see Field 5D.
W79-00375

INFLUENCE OF METHODOLOGICAL FACTORS ON PLATE COUNTING OF AQUATIC BACTERIA: I. STATISTICAL ANALYSIS OF THE INCIDENCE OF TIME LASTING FROM SAMPLE COLLECTION UP TO COMMENCEMENT OF COUNTING, (IN SPANISH),
Instituto Nacional de Limnologia, Santo Tome (Argentina).
F. Emiliani.
Rev Latinoam Microbiol 18(4), p 201-208, 1976.

Descriptors: Reviews, Saprophytes, *Bacteria, *Statistical methods, Water sampling, *Pollutant identification, Analytical techniques.

After reviewing previous papers published on this theme from 1894-1970 and explaining in detail statistical methods employed, the author demonstrates, through mathematical analysis, the importance of the time elapsed from water sampling up to commencement of work on plate counting of saprophytic bacteria and on the interpretation of results.--Copyright 1978, Biological Abstracts, Inc.
W79-00385

INVESTIGATION OF FACTORS AFFECTING BOD MEASUREMENT AND EXPERIENCE WITH THE 1-DAY BOD TEST,
National Council of Paper Industry for Air and Stream Improvement, Inc., New York.
W. L. Carpenter, and H. F. Berger.
NCASI Stream Improvement Technical Bulletin, No. 305, 20 p, March, 1978. 2 fig, 20 ref, 7 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Testing procedures, Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Suspended solids, Analytical techniques, Testing, Refrigeration, Waste water(Pollution), Physical properties, Sampling, Pollutants, Pollutant identification, Waste storage.

The required routine measurement of BOD and suspended solids concentration of final effluents is an integral part of almost every NPDES (National Pollutant Discharge Elimination System) permit but these measurements are time consuming. To reduce the time required for their conduct within the confines of approved methods, an investigation was conducted by the NCASI Southern Regional Center. It showed that external inoculum sources, such as domestic sewage, are not needed in the BOD measurement of biologically treated effluents (e.g., treated bleached kraft mill effluents). Biologically treated effluents were also demonstrated to serve as satisfactory sources of seed for primary effluents in the BOD test, although seeding was not required for most primary effluents. Refrigerated storage (1-13 C) during composite effluent sampling biased the measured BOD upward; 18% and 6% of the refrigerated samples showed an increase of 5 ppm or more and 9 ppm or more BOD, respectively. Although the impact of refrigerated storage was not uniform from mill to mill (nor occasionally among samples at a single mill), the frequent occurrence of measured elevated BOD values with refrigerated storage was evidlent. The initiation of refrigerated storage may, therefore, be significant in an individual mill's ability to meet a discharge permit condition. Favorable mill experiences with the 1-day BOD test in effluent quality management programs are described. (Swichtenberg-IPC)
W79-00405

BIOASSAY RESULTS OF KRAFT MILL EFFLUENT AT ARTIFICIALLY ELEVATED LEVELS OF BIOSOLIDS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5C.
W79-00406

FLAME-PHOTOMETRIC METHOD FOR THE DETERMINATION OF MAGNESIUM IN SPENT LIQUORS OF SULFITE PULP MILLS (PLAMENNOFOTOMETRICHESKII METHOD OPREDELENIYA MAGNIYA V SHCHELOKAKH SUL'FITNO-TSELLYULOZNOGO PROIZVODSTVA),
V. A. Smirnova, S. Kh. Kitaeva, and L. A. Mazitov.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatel'skii Institut Bumagi, No. 10, p 213-216, 1975. 1 fig, 5 ref, 1 tab.

Descriptors: *Sulfite liquors, *Pollutant identification, *Magnesium, *Flame photometry, Wastes, Industrial wastes, Pulp wastes, Pulp and paper industry, Water pollution sources, Effluents, Ion exchanges, Cation exchange, Waste identification, Chemical analysis, Analytical techniques, Spent sulfite liquor.

The method described for determining the magnesium in magnesium-base spent sulfite liquors consists in separating the organic and mineral components on an ion-exchange column filled with a cation-exchange resin, eluting magnesium with HCl solution, and determining it in the eluate by flame photometry. The procedure was applied to spent liquors from laboratory sulfite cooks, and the results were compared with those obtained by the trilonometric method. The results from the two methods differed by not more than 4%. The sensitivity of the flame-photometric determination is 10 micrograms/ml. The method, which is less time-consuming than the presently used method and is more accurate, can be recommended for use in research and mill laboratories. (Stapinski-IPC)
W79-00415

ELECTRIC RESISTANCE OF THE CATION-SELECTIVE MK-40 MEMBRANE DURING ELECTRODIALYSIS OF SPEND SULFITE LIQUOR (ELEKTROSOPROTIVLENIE KATIONOSELEKTIVNOY MEMBRANY MK-40 PRI ELEKTRODIALZE OTRABOTANNOGO SUL'FITNOGO SHCHELOKA),
V. A. Kirsanov, and L. A. Mazitov.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatel'skii Institut Bumagi, No. 10, p 220-223, 1975. 2 fig, 2 ref, 1 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Electrodialysis, *Membranes, Energy, Electrical resistance, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Temperature, Water pollution treatment, Waste treatment, Membrane processes, Dialysis, Separation techniques, Spent sulfite liquor.

The electric resistance of the cation-selective Mk-40 membrane was studied under conditions corresponding to the dialysis process described previously for magnesium-base spent sulfite pulping liquor. It is shown that the resistance of the membrane is determined to a large extent by the degree of base recovery and the temperature of the system, and to a lesser degree by the concentration of the spent liquor. At 22-58C and a liquor concentration range of 77-355 g/liter, the reduction of the membrane resistance is 8-10, 4, and less than 2 ohm-cm/degree centigrade for degrees of recovery of zero, 41, and 69%, respectively. (Stapinski-IPC)
W79-00417

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 1. ULTRAFILTRATION OF EFFLUENTS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES,
Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Wood Chemistry.
For primary bibliographic entry see Field 5D.
W79-00419

THE PHOSPHAGENS OF SOME PROTOZOA AS ECOLOGICAL INDICATORS (IN FRENCH),
Cagliari Univ. (Italy). Faculty of Medicine.
U. Laudani, A. Di Jeso, and F. Di Jeso.
C R Seances Soc Biol Fil 171(3), p 530-534, 1977.

Descriptors: *Phosphagens, *Protozoa, *Bioindicators, Aqutic environments, *Phosopho-arginine, Aspidisca-Lynceus, Colpoda-steini, Colpodium-colpoda, Italy, Paramecium-caudatum, *Sardinia, Urocentrum-turbo.

Five species of non-parasitic ciliate protozoa belonging to 3 orders and used as biological indicators of aquatic environments were collected on the highlands in Sardinia and the nature of their phosphagens studied (Colpodium colpoda Ehrenberg, Paramecium caudatum Ehrenberg, Urocentrum turbo Muler, Colpoda steini Maupas, Aspidisca lynecus Ehrenberg). Phospho-arginine is present in all 5 spp.--Copyright 1978, Biological Abstracts, Inc.
W79-00423

HYDROCHEMICAL INFLUENCES ON THE FISHERY WITHIN THE PHOSPHATE MINING AREA OF EASTERN IDAHO,
Intermountain Forest and Range Experiment Station, Ogden, UT.
For primary bibliographic entry see Field 5C.
W79-00427

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART IV. SULFATE DETERMINATION USING PB(2+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS,
Valmet Oy, Jyvaskyla (Finland).
J. Korhonen, and P. O. Lumme.
Paperi ja Puu, Vol. 60, No. 2, p 81-82, 84-86, February, 1978. 2 fig, 13 ref, 6 tab.

Descriptors: *Water analysis, *Sulfates, *Pulp wastes, Electrodes, Lead, Ions, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Storage, Waste storage, Bacteria, Hydrogen sulfide, Volumetric analysis, White water(Paper machine), Waste water(Pollution).

The Pb(II)-specific electrode was applied to the determination of sulfate ion concentration in paper machine white waters, using direct titration or Gran's method; in the latter, the end-point was established with the help of Gran's plot paper. Samples were collected from two paper machines, one of which contained hydrogen sulfide-forming bacteria in its water circuit. Some samples were analyzed immediately, others were stored in bottles and tested at weekly intervals to examine the effect of anaerobic hydrogen sulfide formation on the analytical data. Direct-titration values were a few percent below the gravimetric data. Gran's technique produced somewhat greater negative errors. Although the concentrations obtained from samples subject to hydrogen sulfide formation showed some variations, the measurements from the other samples had good reproducibility. (See also W74-11094 and W74-11093) (Brown-IPC)
W79-00429

EVALUATION OF DONNAN DIALYSIS FOR THE ENRICHMENT OF CATIONS,
Southern Illinois University, Carbondale, Department of Chemistry and Biochemistry.
J. E. DiNunzio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 182, Price codes: A08 in paper copy, A01 in microfiche. Ph.D Dissertation, September 1977. 137 p, 24 fig, 19 tab, 107 ref. OWRT A-087-ILL(2).

Descriptors: *Chemical reactions, *Dialysis, *Cations, *Ion exchange, *Heavy metals, Electrodialysis, Electrolytes, Chemical analysis, Water analysis, Absorption, Spectroscopy, Ion transport, Membranes, Transfer, Toxicity, Ions, Copper and mercury enrichment, Atomic absorption spectrometry, Ion selective membranes, Cation enrichment, Donnan Dialysis.

The rate of enrichment of cations by Donnan dialysis depends upon the identity of the ion exchange membrane counterion, the ionic strength of the receiver electrolyte, the stirring efficiency and the temperature. With counterions selected from Periodic Groups IA-IIIA, the rate increased with group number and with smaller atomic number within a group; hence Al(III) was the ideal receiver electrolyte cation. Enrichment factors of 10 were accomplished in 30 minutes when Cu(II) was the test species. The method compares favorably, in terms of precision and sensitivity, to solvent extraction as an enrichment method to use in conjunction with atomic absorption spectrometry; however, it is applicable to a wider range of cations. The method was applied to the enrichment of Hg(II) from natural samples. Acidification was necessary to break up the neutral hydroxy complex.
W79-00434

INVESTIGATION OF RAINWATER FOR THE PRESENCE OF ASBESTOS,
Illinois Univ. at the Medical Center, Chicago.
C. S. Hesse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 084, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 47 p, 4 fig, 5 tab, 62 ref. OWRT A-071-ILL(4).

Descriptors: *Rain water, *Asbestos, Sampling, Data collections, Filtration, Illinois, Water pollution sources, Pollution identification, *Chrysotile, Chicago.

A feasibility study was undertaken in order to determine if chrysotile asbestos is present in rainwater. Rainwater samples were collected at one Chicago and two suburban Chicago locations. The Chicago location was near a busy intersection and building construction. The two suburban stations were located in residential areas. None of the suburban rainwater sampls contained levels of chrysotile which were significantly above laboratory contamination levels (alpha = .05). All the Chicago rainwater samples contained significant levels of chrysotile. This finding suggests a mechanism by which asbestos may be transferred from air to surface water.
W79-00437

MUSCULIUM TRANSVERSUM IN THE ILLINOIS RIVER AND AN ACUTE POTASSIUM BIOASSAY METHOD FOR THE SPECIES,
Western Illinois Univ., Macomb.
For primary bibliographic entry see Field 5C.
W79-00443

RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,
West Virginia Univ., Morgantown.
M. L. Double.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 156, Price codes: A07 in paper copy, A01 in microfiche. M S Thesis, 1977. 117 p, 2 fig, 25 tab, 109 ref, append. OWRT A-033-WVA(1).

Descriptors: *Acid mine water, *Coliforms, *Enteric bacteria, *Sewage bacteria, *Streptococcus, Bacteria, Bioindicators, Domestic wastes, E. Coli, Filters, Membranes, Meus-membrane filters, Microorganisms, Mine water, Separation techniques, Sewage effluents, Water pollution, Water quality, Enriched culture media, Bacterial-recovery methods.

Improved membrane-filtration methods for better recovery of sanitary-indicator organisms from aquatic environments containing acid mine water were evaluated. Adjustment of sample pH, use of various membrane-filter brands, and incorporation of an enrichment step were examined for samples from various aquatic environments. Comparison of the recovery efficiency of various methods used to enumerate coliform bacteria from water indicated that generally, multiple-tube fermentation techniques give recovery superior to membrane-filtration procedures, but use of resuscita-

tion broth as an enrichment medium greatly improved the recovery efficiency of the membrane-filtration technique. In some instances, recovery densities of the enriched membrane-filtration procedures, but use of resuscitation broth as an enrichment medium greatly improved the recovery efficiency of the membrane-filtration technique. In some instances, recovery densities of the enriched membrane-filtration method were greater than the Most-Probable-Number technique. Comparison of three brands of membrane filters revealed that Gelman GN-6 yielded the highest coliform recovery and Nuclepore the least. Other methods used to improve the membrane-filtration efficiency proved ineffective. Qualitative studies of the Hartman Run drainage area showed that acid mine water may produce a differential inhibitory effect to members of the Enterobacteriaceae. The use of a two-step enrichment procedure improved the recovery of certain genera, Klebsiella. That enrichment techniques be adopted to aid in assessing the sanitary quality of water is recommended.
W79-00444

A COMPARATIVE IN VITRO STUDY OF THE EFFECTS OF VARIOUS BALANCED SALINE SOLUTIONS ON RESPIRATION RATES OF LIVER TISSUES OF THREE FISH SPECIES,
Tennessee Technological Univ., Cookeville.
For primary bibliographic entry see Field 5C.
W79-00454

CHLOROFLUOROCARBONS AS HYDROLOGIC TRACERS A NEW TECHNOLOGY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. H. Randall, and T. R. Schultz.
Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, p 189-195, 1976. OWRT A-063-ARIZ(3), 14-34-0001-7006.

Descriptors: *Gas chromatography, *Tracers, Air pollution, Atmosphere, Pollutant identification, *Chlorofluorocarbon, Dating water.

The nationwide research undertaken to study environmentally dispersed chlorofluorocarbons introduced into the atmosphere from aerosol cans and refrigeration systems has indicated that these compounds are potentially ideal hydrologic tracers, especially Freon-11 (Cl3CF). The major advantages of Cl3CF as a tracer are its non-polluting conservative nature, extremely low toxicity and sorptivity on clays, quantifiable build-up in the atmosphere, and a detection limit of about 10-14 grams. Quick and inexpnsive detection of Cl3CF can be done using a field-operable gas chromatograph with a pulsed electron-capture detector system. The presence of Cl3CF in ground water, indicating an age of less than 30 years, will permit delineation of recent recharge areas. The absolute age of the recharging water is proportional to the atmospheric concentration of Cl3CF at the time of recharge. The simple quantifiable increase of Cl3CF in the atmosphere should therefore yield more accurate ages than those determined by tritium analysis.
W79-00461

5B. Sources Of Pollution

NUTRIENT LOADING/LAKE TROPHIC CONDITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSHING RATE,
Maine Univ. at Orono.
For primary bibliographic entry see Field 5C.
W79-00001

THE SOURCE OF AMERICAN FALLS RESERVOIR POLLUTANTS,
Idaho State Univ., Pocatello.
D. W. Johnson, and J. C. Kent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 628, Price codes: A02 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1978. 19 p, 1 fig, 1 tab, 35 ref. OWRT A-056-IDA(1). 14-34-0001-7028.

Descriptors: *Idaho, *Upper Snake River Basin(Ida), *Water pollution sources, Sewage effluents, Municipal wastes, Industrial wastes, Chlorinated hydrocarbon pesticides, Pesticide residues, *Non-point pollution sources, Pollutants, *Cadmium, *Mercury, Portneuf River(Ida), Snake River(Ida), *America Falls Reservoir(Ida).

The Upper Snake River Basin contained elevated amounts of cadmium and mercury. Three sources are possible: sewage effluents from large towns in the area, run-off from irrigated lands (both cadmium and mercury are found in phosphate fertilizers), or drift from air currents carrying emissions from phosphate and cement plants. Industrial and municipal facilities located adjacent to the lower Portneuf River near Pocatello appear to be contributing cadmium and mercury to the aquatic environment. Chlorinated hydrocarbons detected in dangerous levels in reservoir fishes are usually associated with agricultural pesticides that have entered the water; however, low solubility in water results in undetectable levels in both the Portneuf and Snake Rivers.
W79-00004

CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.
F. W. Pontius.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 576, Price codes: A16 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 325 p, 82 fig, 84 tab, 70 ref, append. OWRT A-028-COLO-(3). 14-34-0001-8006.

Descriptors: *Urban runoff, *Stormwater, Runoff, Water quality, *Urban drainage, Water pollution treatment, Water pollution sources, *Waste water treatment, Cities, Water treatment, Chemical precipitation, Ferric chloride, Lime, Filtration, Sedimentation.

A 125 acre urban area and a 15 acre agricultural area were selected for study. The urban area was serviced by separate storm and sanitary sewer systems and had an average population density of 12 persons per acre. The agricultural area was cultivated in alfalfa and had an average slope of 2.5 feet per 100 feet. Concentrations of pollutants in the urban stormwater runoff were found to vary widely. Solids, COD, chlorides, and bacterial densities were found at significant levels. Nutrient levels remained low throughout the study period. Pollutant contributions due to stormwater runoff from the urban area were significantly lower than those reported in previous studies. This was attributed to the differences in land use between the areas investigated. The significance of snowmelt runoff from the urban area appeared to be minor when compared to the estimated pollutants contributed by treated sewage from a similar size area. Processes evaluated for the treatment of urban stormwater runoff were plain sedimentation, chemical clarification using alum, ferric chloride, and lime, and filtration. Clarification with ferric chloride was the most effective process, yielding an average pollutant removal efficiency of 89 percent. Filtration and clarification with alum were also effective, resulting in average pollutant removals of 87 and 84 percent, respectively. The effectiveness of plain sedimentation was found to depend on the nature of the individual stormwater samples. A detention time of four hrs. resulted in an overall removal efficiency of only 42%.
W79-00005

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
D. O. Whittemore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 578, Price codes: A04 in paper copy, A01 in microfiche. Contribution No 197, August 1978. 46 p, 14 fig, 8 tab, 12 ref. OWRT A-080-KAN(1). 14-34-0001-8018.

Descriptors: *Rivers, Water quality, Kansas River basin, *Arkansas River basin, Runoff, Watershed management, Chemical precipitation, Watershed studies, *Water quality control, *Quickflow, *Baseflow.

The most important factor controlling the quality of river waters in Kansas is the variation in the amounts and chemistry of quickflow (reflecting dissolution of constituents from soils and near surface alluvium) versus baseflow (mainly groundwater inflow). Given similar bedrock, the higher the average annual precipitation and the lower the average evaporation rate, the lower the total dissolved solids (TDS) of both quickflows and baseflows. Quickflows have lower TDS and Na/(Na + Ca) than baseflows. Primary sources of high TDS in baseflows are saline formation waters and dissolution of halite and gypsum; in western and central Kansas evaporative concentration also contributes to high TDS and can increase Na/(Na + Ca) slightly by calcite crystallization. Two types of cyclic relationships occur in chemical hydrographs of precipitation or snowmelt events: a quickflow flushing-dilution cycle follows a counterclockwise loop and a quickflow dilution-saline groundwater discharge cycle a clockwise loop when discharge is plotted versus specific conductance, TDS, or Na/(Na + Ca). A procedure is proposed for controlling the quality of river waters receiving saline groundwaters: a system of small flood retarding and recharge structures with baseflow release drains should be built far enough upstream of saline inflow areas, that groundwater recharge increases good quality baseflow and decreases mineralized discharges.
W79-00006

IS CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER.,
Illinois Univ. at the Medical Center, Chicago.
For primary bibliographic entry see Field 5A.
W79-00013

DETERMINATION OF CHRYSOTILE ASBESTOS IN RAINWATER,
Illinois Univ. at the Medical Center, Chicago.
For primary bibliographic entry see Field 5A.
W79-00014

UPTAKE AND FATE OF DI-2-ETHYLHEXYL PHTHALATE IN AQUATIC ORGANISMS AND IN A MODEL ECOSYSTEM,
Illinois Univ. at Urbana-Champaign Dept. of Zoology and Entomology.
R. L. Metcalf, G. M. Booth, C. K. Schuth, D. J. Hansen, and P. Y. Lu.
Environmental Health Perspectives, Experimental Issue, No. 4, p 27-34, 1973. 5 fig, 3 tab, 11 ref.

Descriptors: *Plastics, *Absorption, *Biodegradation, Organic compounds, Path of pollutants, Animal metabolism, Daphnia, Mosquitos, Clams, Food chains, Food webs, Chemical properties, Industrial wastes, Chemical wastes, *Phthalates, *Teratogens, *Biomagnification, *Tissue analysis, Di-z0ethylhexyl phthalate.

The experiments demonstrated that DEHP is a microchemical environmental pollutant which is rapidly biomagnified by a variety of plants and

animals in an aquatic system. DEHP is biodegraded very slowly in algae, Daphnia, mosquito larvae, snails, and clams and more rapidly in fish. However, DEHP closely resembles DDT in rate of uptake and storage, and it obviously partitions strongly in the lipids of plants and animals and is concentrated through food chains. The biomagnification of DEHP together with its teratogenic properties and its enormous rate of production and ubiquitous use indicate the need for much further study of its environmental distribution and fate. Present data suggest the need for restrictions on the use and waste disposal of DEHP. (EIS-Deal)
W79-00061

STUDIES ON THE PATHWAYS AND EFFECTS OF CADMIUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Kiel Univ. (West Germany). Inst. fuer Meerekunde.
K. Kremling, J. Piuze, K. von Brockel, and C. S. Wong.
Marine Biology, Vol. 48, p 1-10, 1978. 11 fig, 3 tab, 26 ref.

Descriptors: *Cadmium, *Phytoplankton, *Biological communities, Ecosystems, Heavy metals, Water pollution effects, Membrane processes, Biological membranes, Toxicity, On-site data collections, Comparative productivity, Productivity, Biomass.

Two experiments were performed during 1975 and 1976, in which cadmium was added to seawater and its plankton enclosed in plastic containers moored in Saanich Inlet (Vancouver Island, Canada), as part of the CEPEX project. In both experiments, two enclosures were used; one was spiked with about 1.3 microg l-1 cadmium, while the other served as a control, to assess the fate of the added metal and its effect on marine phytoplankton. In both experiments, the pattern of biological events was found to be very similar for the cadmium-treated bag and for the control. Furthermore, there was no marked differences in the phytoplankton species composition, thus indicating that at this concentration level cadmium did not affect the ecosystem. The rate of removal of cadmium by biological processes was relatively slow. Experiments on the mechanism of cadmium binding indicated that the major part of the particulate metal is loosely bound to the outer cell membranes. (EIS-Deal)
W79-00066

UPTAKE OF AMERICUM-241 BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, Jr., and D. Paine.
Progress in Water Technology, Vol. 9, p 845-857, 1977. 4 fig, 3 tab, 27 ref.

Descriptors: *Radioisotopes, *Absorption, *Membrane processes, Cytological studies, Biological membranes, Bacteria, Path of pollutants, Chlorophyta, Chemical analysis, Chemical properties, Metabolism, Hazards, Radioactive wastes, *Americum, Biomagnification.

Algae and bacteria concentrate 241Am to a high degree, which makes them important links in the biomagnification phenomenon which may ultimately lead to a human hazard. The ability of algae and bacteria to highly concentrate 241Am makes them potentially important in cycling 241Am in the water column and mobilization from the sediments. (EIS-Deal)
W79-00067

TRANSURANIC NUCLIDES IN PLAICE (PLEURONECTES PLATESSA) FROM THE NORTH-EASTERN IRISH SEA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath, and M. B. Lovett.
Marine Biology, Vol. 48, p 19-26, 1978. 2 fig, 8 tab, 8 ref.

Descriptors: *Radioisotopes, *Nuclear wastes, Animal metabolism, Path of pollutants, Nuclear energy, Radioactive wastes, Fish physiology, Public health, Radioactive waste disposal, Water pollution sources, Hazards, Marine fish, *Plaice, Pleuronectes, *Tissue analysis, *Americium, *Plutonium, Curium, Flounders, Irish Sea.

The concentrations of a number of alpha-emitting nuclides, 238Pu, 239/240Pu, 241Am, 242Cm and 243/244Cm have been determined in the organs of plaice caught in the vicinity of a nuclear fuel reprocessing plant. Fish were taken for analysis every 3 months for a period of 2 years. During this period, the highest concentrations of plutonium and mericium nuclides were found in the kidney and the lowest in muscle. In all of the organs analysed, the concentrations of americium were greater than those of plutonium: they were also greater than plutonium when related to the rates of discharge of these two elements and gave higher concentration factors over samples of filtered shore-line sea water taken from the area. (EIS-Deal)
W79-00077

FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II,
American Museum of Natural History, Placid, FL. Archbold Biological Station.
For primary bibliographic entry see Field 5C.
W79-00100

POLLUTION OF GROUNDWATER THROUGH NONLINEAR DIFFUSION,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and V. V. N. Murty.
Journal of Hydrology, Vol. 38, No. 3/4, p 243-247, August 1978. 3 fig, 10 ref.

Descriptors: *Groundwater, *Water pollution, *Diffusion, Aquifers, Water pollution sources, Pollutants, Path of pollutants, Model studies, Mathematical models, Equations, Nonlinear diffusion.

An analytical solution for the prediction of the spread of contaminant caused by nonlinear diffusion in an aquifer adjoining a polluted source was presented. The solution was based on the assumption of the existence of a sharp diffusion front and was similar to the solution of a two-dimensional unsaturated flow problem. The effect of concentration dependency of the diffusion coefficient on the contamination spread was discussed. (Sims-ISWS)
W79-00110

STREAM TEMPERATURE ESTIMATION USING KALMAN FILTER,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
C. L. Chiu, and E. O. Isu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 13991, p 1257-1268, September 1978. 4 fig, 16 ref, 2 append.

Descriptors: *Water temperature, *Streams, *Model studies, *Statistical methods, Mathematics, Equations, Stochastic processes, Systems analysis, Theoretical analysis, Mathematical models, Analytical techniques, Surface waters, Rivers, Regression analysis, Streamflow, Forecasting, Time series analysis, *Kalman filter.

The system model used combines the deterministic sinusoidal model with a simple stochastic (first-order autoregressive) model of the residuals from the actual temperature of the temperature estimation given by the sinusoidal model. The estimation and forecasting technique was tested for its capability to generate daily streamflow temperature between several different measurement intervals. Results with Kalman filter were compared with those obtained in the 4 parallel models (the sinusoidal, the sinusoidal coupled with either the first-order or second-order autoregressive modeling of the random deviations, and the sinusoidal coupled with first-order autoregressive-moving average modeling of the random deviations). The mean-square deviation of estimated or predicted temperatures from the actually observed was used to measure the relative accuacy of the estimations by the 5 different techniques. The results showed a definite advantage of using Kalman filter. (Humphreys-ISWS)
W79-00121

ACID PRECIPITATION IN THE NETHERLANDS,
Department of Environmenta Control, Haarlem (Netherlands).
For primary bibliographic entry see Field 5A.
W79-00138

MEMBRANE CONCENTRATION OF INFECTIOUS BOVINE RHINOTRACHEITIS VIRUS FROM WATER,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 5C.
W79-00148

B. R. /HANSON ;I. A. /SCHIPPER
North Dakota State Univ., Fargo. Dept. of Veterinary Science.
For primary bibliographic entry see Field 5C.
W79-00150

SEA-WATER NEUTRALIZATION OF EFFLUENTS FROM THE INDUSTRIAL PROCESSING OF PHOSPHORITE. A CASE STUDY IN THE PRACTICAL USE OF BASIC KNOWLEDGE IN ANALYTICAL AND MARINE CHEMISTRY,
Chalmers Univ. of Technology, Gotborg (Sweden); and Goteborg Univ. (Sweden). Institutionen for Analytisk Kemi.
For primary bibliographic entry see Field 5G.
W79-00151

ADSORPTION OF SOME TOXIC SUBSTANCES BY WASTE COMPONENTS,
Waste Research Unit, Oxon (England). Harwell Lab.
C. J. Jones, P. J. McGugan, A. J. Smith, and S. J. Wright.
Journal of Hazardous Materials, Vol. 2, No. 3, p 219-225, 1977/1978. 3 tab, 7 ref.

Descriptors: *Adsorption, *Cadmium, *Toxins, *Solid wastes, *Leachate, Isotherms, Textiles, Anions, Cations, Solvents, Plastics, Sands, Aqueous solutions, Leaching, Arsenic compounds, Waste water treatment, Metals, Chemical wastes, Chemical industry, Industrial wastes.

Refuse components were capable of adsorbing significant quantities of inorganic cationic cadmium, inorganic anionic arsenate, and the halogenated solvent, trichloroethylene, when contacted for a sufficient period of time. A 1000 mg/liter sample of each toxic substance was mixed with an aqueous solution bearing 5000 vpm of acetic acid to represent leachate from a landfill or waste depository; sodium hydroxide was used to vary the pH over 3, 7, and 9. A 200 ml aliquot of the solution was contacted for 24 hrs at 30C with 10 g of unprinted newspaper, dacron/cotton material, polyethylene, and lower greensand, representing refuse components. The adsorption of arsenate

and cadmium by the refuse components generally conformed to a Langmuir isotherm with only several instances of observed reversible adsorption. The saturation concentrations in the absorbents ranged about 6,500-15,000 ppm cadmium and about 25-500 ppm arsenate; for both toxins, paper was the most efficient adsorbent, although some reversibility was observed. A Freundlich isotherm depicted the linear adsorption of trichloroethylene from solution onto the refuse components; the saturation concentration of the toxin ranged over 8,000-10,000 ppm (volume/wt) in polyethylene and textile. Saturation levels were lower with paper and with decreasing pH. The solution pH had a significant effect on the adsorption of arsenate and to a lesser extent on cadmium and trichloroethylene. (Lisk-FIRL)
W79-00152

DEGRADATION OF AQUEOUS PHENOL SOLUTION BY GAMMA IRRADIATION,
Hiroshima Univ., (Japan). Inst. of Environmental Chemistry.
For primary bibliographic entry see Field 5D.
W79-00153

OIL-TROUBLED WATER,
American Ground Water Consultants, Albuquerque, NM.
W. M. Turner.
Geotimes, Vol. 23, No. 9, p 21-22, September, 1978.

Descriptors: *Pollution abatement, *Groundwater movement, *Groundwater contamination, *Oil spills, Reclamation, Remote sensing, Organic compounds.

The International Association of Hydrogeologists held a symposium in Prague on June 4-6 which dealt with problems of ground-water contamination by oil spill in highly industrialized areas. The main themes of the symposium were: (1) methods of hydrogeologic exploration and decontamination of rock and ground water contaminated by oil; (2) movement of oil in ground water and rocks; (3) chemical relations in the rock-ground water-oil system; and (4) location and delimitation of contaminated rock and ground water by surface methods. Remote sensing methods to delineate areas contaminated by oil spills, and physical and biological methods of reclamation were among the 34 technical papers presented. Following the technical sessions, there were two field trips to spill sites where physical reclamation methods were being employed. At one site, large diameter wells were used to remove the hydrocarbon, while at the other site, deep trenches were used. (Purdin-NWWA)
W79-00169

NO WATER-SOURCE DAMAGE FOUND IN OIL STATES.
For primary bibliographic entry see Field 5G.
W79-00172

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX A,
Battelle Pacific Northwest Labs., Richland, WA.
A. Brandstetter, D. B. Cearlock, R. G. Baca, W. W. Waddel, and C. R. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 933, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, DC, August 1973. 87 p, 8 fig, 2 tab, 117 ref.

Descriptors: *River basin development, *Project planning, *Water pollution, *Computer models, *Simulation analysis, *Water quality control, Biochemical oxygen demand, Hydrodynamics, Stratification, Hydraulic models, Reviews, Mathematical models, Benthos, Dissolved gases, Algae, Carbon, Oxygen, Toxicity, Equations, Systems analysis, Bibliographies.

Battelle-Northwest has developed a generalized, comprehensive mathematical water quality model, EXPLORE-I, for use in river basin planning and water resource studies. The model can predict the hydrodynamics and water quality dynamics for rivers, well-mixed estuaries, and thermally-stratified reservoirs. This computer model is an extended and modified version of the Storm Water Management Model (receiving-water component) which was developed for studies of DO/BOD dynamics. This appendix 'A' to the main report entitled, 'EXPLORED-I: A River Basin Water Quality Model', contains a comprehensive review of various water quality submodels, river and estuary hydrodynamic models, and deep reservoir hydrothermal models. The water quality submodels identified herein are the result of an extensive literature survey of over three-hundred seventy published articles and books. (See also W79-00187) (Bell-Cornell)
W79-00188

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX B,
Battelle Pacific Northwest Labs., Richland, WA.
R. G. Baca, W. W. Waddel, C. R. Cole, A. Brandstetter, and D. B. Cearlock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 934, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., August 1973. 97 p, 16 fig, 15 tab, 6 ref.

Descriptors: *River basin development, *Water pollution, *Computer models, *Water quality control, *Simulation analysis, Computer programs, Streamflow, Waste disposal, Sewage treatment, Mathematical models, Hydraulics, Systems analysis.

Battelle-Northwest has developed a generalized, comprehensive mathematical water quality model, EXPLORE-I, for use in river basin planning and water resource studies. This computer model stimulates the dynamic hydraulic and water quality characteristics of a river basin to study the effects of various flow conditions, waste discharge, and treatment schemes on water quality levels; it can also be used to study lakes, reservoirs (thermally-stratified), and well-mixed estuaries. It is an extended and modified version of the Storm Water Management Model (receiving-water component) which was developed for studies of DO/BOD dynamics. This User's Manual, Appendix B provides the information needed for setting up and analyzing a river basin. Descriptions of the models and their use are also provided. (See also W79-00187) (Bell-Cornell)
W79-00189

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY. APPENDIX C,
Battelle Pacific Northwest Lab., Richland, WA.
R. G. Baca, W. W. Waddel, C. R. Cole, A. Brandstetter, and D. B. Cearlock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 935, Price codes: A13 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., August 1973. 283 p, 37 fig, 3 tab, 4 ref.

Descriptors: *River basin development, *Water pollution, *Computer models, *Water quality control, *Simulation analysis, Stratification, Hydraulic models, Coding, Flow charting, Manuals, Tables(Data), Subroutines, Systems analysis.

EXPLORE-I, the Battelle-Northwest water quality model, is a computer program which simulates the dynamic hydraulic and water quality characteristics of a river basin. It can be used to study the effects of various flow conditions, waste discharge, and treatment schemes on the water quality levels of lakes, reservoirs, streams, and rivers. This Programmer's Manual provides the basic programming requirements of the EXPLORE-I codes. Included are flow diagrams, variable definition tables, program listings, and brief descriptions of the main subroutines. Portions of this document are not fully legible. (See also W79-00187) (Bell-Cornell)
W79-00190

THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL,
Michigan Univ., Ann Arbor. Sea Grant Program.
E. Seibel, J. M. Armstrong, and C. L. Alexander.
International Reference Group on Great Lakes Pollution from Land Use Activities, September 1976. 46 fig, 27 tab, 137 ref, 2 append. GLBC 75D1 and EPA 68-01-1598.

Descriptors: *Great Lakes, *Erosion rates, *Sediments, *Water pollution sources, *Chemical analysis, *Shores, Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario, Bluffs, Land use, International Joint Commission, Littoral, Waves(Water), Wind erosion, Recession rates, United States, Beach erosion, Weathering.

Annual volumetric contributions of sediment from the U.S. shoreline of the Great Lakes were estimated on the basis of shore recession rates for about 44% of the erodible shoreline, and chemical constituents of transported material were calculated. Estimates of total quantity and quality of eroded material will be included in a subsequent study. The following aspects are covered: (1) nearshore erosion processes, (2) methodology, (3) bluff recession, and (4) erosion and chemical input to the Great Lakes from the U.S. shoreline. Data clearly demonstrate that erosion varies among locations, and erosion and shore recession rates for any one point can vary significantly from average values for the particular shore form. Shore recession data were obtained from various sources, and a weighted average annual, maximum annual, and minimum annual recession rate were estimated for each section of the U.S. Great Lakes shoreline for which there were data. The volume of material contributed from bluff recession was determined using the rectangular prism method. High annual recession rates were found on shores of southwestern Lake Superior (exceeding three m), eastern Lake Michigan (over one m), southwestern Lake Huron, and western Lake Erie (over 1.5 m). (Lynch-Wisconsin)
W79-00249

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI,
Geological Survey, Rollo, MO. Water Resources Div.
J. H. Barks.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $3.25. Water-Supply Paper 2048, 1978. 57 p, 8 fig, 2 plates, 20 tab, 34 ref.

Descriptors: *Water pollution sources, *National parks, *Wild rivers, *Recreation facilities, *Water analysis, Nutrients, Pesticides, Bacteria, Trace elements, Aquatic environment, Missouri, *Ozark National Scenic Riverways.

During an intensive water-quality study of the Ozark National Scenic Riverways in Missouri, dissolved-solids concentrations averaged 276 mg/liter in ground water and less than 200 mg/liter in springs and streams. Calcium, magnesium, and bicarbonate constituted more than 90 percent milliequivalents of the total ions in the waters. Total

itrate concentrations as nitrogen averaged 0.22 ng/liter in ground water, 0.42 mg/liter in springs, nd less than 0.65 mg/liter in streams. Minor-ele-nent concentrations were generally low, but on ne occasion there were anomalously high concen-rations of total barium, lead, silver, and zinc in amples from Blue Spring and four stream-index tations. The only pesticides detected were 0.03 nicrograms per liter of 2, 4-D and 0.03 micrograms er liter of 2, 4, 5-T in the Current River. Commu-nities and developed campgrounds exhibited no letectable influence on the quality of water in treams. However, concentrated swimming activi-ies caused slight increases in bacteria densities, nd concentrated horseback riding activities esulted in significant increases in fecal coliform nd fecal streptococcus densities in the Jacks Fork. Phytoplankton, periphyton, and benthic in-vertebrate types and populations in the Current River and Jacks Fork indicate generally unpolluted conditions. (Woodard-USGS)
W79-00254

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, WI. Water Resources Div.
M. G. Sherrill.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $4.75. Water-Supply Paper 2047, 1978. 38 p, 13 fig, 5 plates, 5 tab, 34 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Path of pollutants, *Aquifer characteristics, Groundwater availability, Water level fluctuations, Groundwater availability, Water level fluctuations, Groundwater recharge, Water wells, Water yield, Aquifer management, Water supply, Hydrologic data, Wisconsin, *Door County, *Silurian dolomite.

Door County, Wis., has a long history of groundwater contamination. The problem is most severe in late summer, when tourists and fruit-canning operations generate additional contaminants. Fecal organisms from ineffective waste-disposal systems are the major ground-water contaminants. Contaminants also enter the ground-water system from agricultural, industrial, and municipal sources. Most contaminated ground water is in populous areas that lack sewage-treatment facilities and that are underlain by fractured bedrock at or near the surface. This report describes the geology, ground water, hydrology, and groundwater quality in Door County to provide a better basis for planning future wells. Several geologic and hydrologic factors were considered and studied. Ten bedrock wells, ranging in depth from 47 to 1,845 ft were drilled and tested by the U.S. Geological Survey. The thicknesses of unconsolidated deposits and Silurian rocks were determined, and the areal extent of the Silurian dolomite aquifer system was outlined. Chemical and bacterial ground-water quality was monitored. Ground-water and contaminant movement were determined in selected areas, and this information was used to define areas of potential ground-water contamination. (Woodard-USGS)
W79-00256

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
E. A. Jenne, and S. N. Luoma.
In: Biological Implications of Metals in the Environment: Proceedings of the Fifteenth Annual Manford Life Sciences Symposium at Richland, Washington, September 29-October 1, 1975, p 110-143, 1977. 1 fig, 2 tab, 187 ref.

Descriptors: *Trace elements, *Analytical techniques, *Surface waters, *Sediments, *Biota, *Biological communities, Aquatic populations, Geochemistry, Water temperature, Physicochemical properties, Heavy metals, Suspended solids, Organic matter, Soil chemistry, Water quality, Environment, Absorption, Solutes.

The particular physicochemical forms of trace elements in waters and sediments are of major importance in determining the biological availability of trace elements to biota. The thermodynamic activity of the uncomplexed ion is probably the single most important factor affecting the biological availability of solute trace elements. Most of the data showing a decrease in trace element assimilation, by freshwater organisms, with increasing waterhardness can be interpreted in terms of a decrease in activity of the element due to precipitation and to formation of carbonate, hydroxide, and other complexes. With some exceptions, complexation of solute trace elements by organic ligands also decreases their biological availability. Experimental evidence indicates that trace element assimilation from solid forms (sediment) by detritus ingesting aquatic orgnisms is dependent upon trace element form, but occurs much slower than the assimilation rate from solute forms. The biological importance of solid forms of trace elemets may be principally due to their regulation of equilibrium solute concentrations in the associated waters via sorption - desorption and dissolution - precipitation reactions.
W79-00271

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-00272

MICROBIAL DEGRADATION OF DDT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-00278

SAMPLING AND MODELING OF NON-POINT SOURCES AT A COAL-FIRED UTILITY,
Research Corp. of New England, Wethersfield, CT.
G. T. Brookman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 369, Price codes: A13 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-199, 268 p, Sept 1977. 11 fig, 35 tab, 4 app, 21 ref.

Descriptors: *Mathematical models, *Leachate, *Coals, *Runoff, Model studies, Statistical models, Water pollution sources, Fossil fuels, Powerplants, On-site data collections, Utilities, Electric powerplants, Streams, Path of pollutants, Air pollution, *Coal powerplants, Nonpoint sources.

The report gives results of a measurement and modeling program for non-point sources (NPS) from two coal-fired utility plants, and the impact of NPS on receiving waters. The field measurement survey included measurement of overland runoff from NPS and river sampling upstream and downstream of each plant site. NPS sampled from storm water runoff and leachate from coal storage piles and runoff from impervious areas such as parking lots and roofs which were covered with dust fallout from coal and ash handling operations. A mathematical model was developed to simulate both the quantity and quality of industrial NPS pollution and its impact on receiving waters. Field data indicated that NPS pollution from utilities had little impact on the two rivers, compared to the impact from sources upstream of each site. Modeled results compared to field measurements within a factor of 4 for both the quantity and quality of storm water runoff and its impact on the quality of the receiving waters. (EIS-Deal)
W79-00279

A LYSIMETRIC STUDY OF WATERS IN AN IRRIGATED PASTURE (IN RUSSIAN),
Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Meadow Science.
For primary bibliographic entry see Field 2G.
W79-00284

LABORATORY STUDY OF THE RELEASE OF PESTICIDE AND PCB MATERIALS TO THE WATE COLUMN DURING DREDGING AND DISPOSAL OPERATIONS,
Envirex, Inc., Milwaukee, WI.
For primary bibliographic entry see Field 5A.
W79-00286

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT,
Versar, Inc., Springfield, VA.
F. C. Whitmore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 220, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/6-77-006, July 1977. 158 p, 14 fig, 43 tab, 5 app, 39 ref. NTIS PB-270 220.

Descriptors: *Polychlorinated biphenyls, *Great Lakes, *Lake Michigan, *Mathematical models, Path of pollutants, Water pollution sources, Lakes, Model studies, Statistical models, Sediments, Air pollution, Water chemistry, Water analysis, Aroclors, Chemical properties, *Bioaccumulation.

A first order model for the sources, distribution and fate of PCBs in an aquatic system is described. The model is then applied to Lake Michigan and to the Great Lakes System. The results obtained from the model indicate that atmospheric sources are a major PCB input to the Great Lakes. Because of the great water mass of the lakes, the PCB concentration appears to be storage controlled rather than loss controlled. The major loss mechansims are found to be co-evaporation from the air-water surface interface and entrapment with sediments. It is estimated that if all inputs of PCBs rate in Lake Michigan were eliminated, it would take more than 70 years for the concentration of PCBs in the water to decrease by 50 per cent. (EIS-Deal)
W79-00289

MULTIMEDIA LEVELS--MERCURY,
Battelle Columbus Lab., Columbus, OH.
V. J. DeCarlo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 201, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/6-77-031, September 1977. 150 p, 18 fig, 47 tab, 220 ref.

Descriptors: *Mercury, Path of pollutants, Chemical analysis, Water analysis, Public health, Human pathology, Industrial wastes, Water pollution sources, Air pollution, Food habits, Food chains, Food webs, Fish physiology, Heavy metals, Geothermal studies, *Tissue analysis, *Bioaccumulation, Environmental levels.

This report is a review of environmental levels of mercury based on published reported and other information sources. Mercury levels are reported for the atmosphere, surface, and ground waters, drinking water, sediments, soils, terrestrial and

aquatic biota and man. The behavior of mercury in the environment is also discussed. Higher than ambient levels of mercury are found near mercury mines, geothermal steam fields, power plants, incinerators, sewage treatment plants, some industralized areas, and indoors where mercury is used. The release of mercury from natural sources to air and water is double the man-related losses to these media. The levels of mercury in biota are variable, depending on food habits and environmental conditions. The highest levels occur in animals at the top of the trophic structure. Mercury levels in tissues of humans are elevated in chlor-alkali industry workers, in dentists, in people from areas with natural mercury deposits, and in urban populations as compared with the rural. (EIS-Deal)
W79-00291

STUDIES IN MICROBIAL CHEMOTACTIC BEHAVIOR IN SEAWATER,
Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W79-00293

ENVIRONMENTAL EFFECTS OF SCHUYLKILL OIL SPILL II, JUNE 1972.
Environmental Protection Agency, Washington, DC. Spills Prevention and Control Board.
For primary bibliographic entry see Field 5C.
W79-00294

TRACING SEWAGE EFFLUENT RECHARGE - TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W79-00299

LONGITUDINAL DISPERSION OF FLUID PARTICLES IN MOUNTAIN STREAMS: I. THEORY AND FIELD EVIDENCE,
Geological Survey of Canada, Ottawa (Ontario).
T. J. Day.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 7-28, 1977. 9 fig, 4 tab, 30 ref.

Descriptors: *Dispersion, *Streams, *Mountains, Streamflow, On-site investigations, Tracers, Salts, Sodium chloride, Mixing, Model studies, Theoretical analysis, Analytical techniques, Rivers, Hydraulics, Hydrology, Mountain streams, Lognitudinal dispersion.

The longitudinal dispersion of fluid particles in mountain streams was investigated in a series of 49 experiments. Mean properties of the dispersion process were studied over a maximum downstream distance of 2,250 m, a mean velocity range of 0.32-1.57 m/s, and a mean flow width range of 2.7-21.8 m. It was shown conclusively that for distances of up to 800 mean channel widths in these steep, turbulent streams, the spread of standard deviation of an initially concentrated mass increases linearly with distance, and not as its square root as necessary for the application of conventional mixing models. Consequences of this linearity are an ever-increasing dispersion coefficient along the channel and a persistent asymmetrical concentration distribution. (See also W79-00309) (Sims-ISWS)
W79-00308

LONGITUDINAL DISPERSION OF FLUID PARTICLES IN MOUNTAIN STREAMS: 2. SIMILARITY OF THE MEAN MOTION AND ITS APPLICATION,
Geological Survey of Canada, Ottawa (Ontario).
T. J. Day.
Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 26-52, 1977. 24 fig, 2 tab, 5 ref, 1 append.

Descriptors: *Dispersion, *Streams, *Mountains, Streamflow, Mixing, On-site investigations, Tracers, Salts, Sodium chloride, Data processing, Model studies, Analytical techniques, Rivers, Hydraulics, Hydrology, Mountain streams, Longitudinal dispersion.

The mean longitudinal motion of fluid particles dispersing in mountain streams was shown, for distances up to 800 mean channel widths, to exhibit the characteristics of a self-similar process with constant velocity ratios and geometric form. Although the kinematic relations and the structure of the turbulent field were shown to be sensitive to the nature of the flow boundaries and the geometry of the channel, similarity was shown to exist for flows in a wide range of steep gravel- and boulder-bed channels. A dimensionless time-concentration curve was developed, and a method for prediction of the dispersion pattern, based upon the co-ordinates of this shape and the linearity of its scaling parameters, was presented. (See also W79-00308) (Sims-ISWS)
W79-00309

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-00321

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUNTAINOUS BASIN,
British Columbia Univ., Vancouver. Dept. of Geography.
L. J. Zeman, and O. Slaymaker.
Hydrological Sciences Bulletin, Vol. 23, No. 1, p 103-117, March 1978. 2 fig, 4 tab, 29 ref.

Descriptors: *Watersheds(Basins), *Fallout, *Canada, *Model studies, *Precipitation(Atmospheric), Ions, Cations, Discharge(Water), Mountain forests, Data collections, On-site investigations, Mountains, Surface waters, Chemical analysis, Water pollution, Statistical methods, Data processing, Sodium, Potassium, Calcium, Magnesium, Bicarbonates, Sulfates, Phosphates, Hydrogen ion concentration, *British Columbia, Mass balance, Pristine forests.

A mass balance model was designed to determine the contribution of ionic loads in atmospheric fallout to discharge from a pristine forested mountainous basin in British Columbia. Input to the model consisted of measurements of weekly precipitation amounts (mm) and ionic concentrations (mg/l) in bulk fallout on 4 elevation zones of an experimental basin. Output data consisted of instantaneous hydrometric measurements, expressed in flow units per basin area (mm) and ionic concentrations (mg/l) measured in weekly intervals at the basin outlet. The weekly data on volume weighted ionic concentrations in bulk fallout and discharge were used for calculation of monthly ionic loads (kg/ha/month) and their monthly input-output balances. The annual loads (kg/ha/yr) in bulk fallout and discharge as well as the annual input-output balance were determined from the monthly loads. Implication of the hydrochemical balance for precipitation and stream chemistry variations, weathering, erosion, and denudation rates in a perhumid moutainous basin in coastal British Columbia was discussed. The model is sufficiently general in its design to be used for the assessment of hydrochemical input-output budgets in any moutainous basin unit. Its applicability is particularly evident for systems in which classical dissolved solids concentration-discharge relationships are highly variable over space and time. (Humphreys-ISWS)
W79-00332

CHANGES IN INTERSTITIAL WATER SALINITY OF A MISSISSIPPI TIDAL MARSH,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W79-00338

WATER -- 1977.
American Inst. of Chemical Engineers, New York.
For primary bibliographic entry see Field 5D.
W79-00342

MODELING AND MONITORING OF TOXIC SPILLS AND TOXIC EFFLUENTS,
Research Corp. of New England, Wethersfield, CT.
R. E. Kenson.
Available from Copyright Clearance, Inc., New York, NY as 0065-8812-78-9861-0178 ($0.95). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 1-5, 1978, 3 fig, 2 tab, 4 ref.

Descriptors: *Water pollution, *Toxicity, *Effluents, *Monitoring, *Model studies, *Pollutant identification, Analytical techniques, Pollutants, Mass spectrometry, Gas chromatography, Colorimetry, Absorption spectroscopy, Absorption, High pressure liquid chromatography.

Various approaches to solving practical water pollution problems are evaluated with emphasis on monitoring and modeling of toxic effluents. Definition of the problem is the first, most important, step before deciding on the course of action to be pursued. This is recommended even in crisis situations where immediate action is being demanded. Monitoring techniques which aid in defining a toxic pollutant problem include: gas chromatography/mass spectroscopy which has proved effective for most volatile organic pollutants; atomic absorption which is used for metals after they have been chelated and extracted from solution; and colorimetric analysis and specific ion electrode methods which may be preferred for specific chemicals, such as fluorides, phenols, and cyanides. Caution is advised in using gas chromatographic methods along without corroboration because it can be misleading. For components of low volatility, the use of high pressure liquid chromatography is recommended as an attractive alternative. Predictive mathematical modelling techniques are described as an effective supplement to sampling/analysis but caution is advised here, too. Factors that should be considered in evaluating a modelling study are: (1) accuracy of the volume and release rate data of the pollutant; (2) solubility and specific gravity of the toxic pollutant; (3) validity of the model for application. (See also W79-00342) (Majtenyi-IPA)
W79-00343

APPLICATION OF ION EXCHANGE/ADSORPTION MODELS TO VIRUS TRANSPORT IN PERCOLATING BEDS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W79-00353

MODELLING THE WATER QUALITY OF THE HYDROLOGICAL CYCLE.
Proceedings of the Baden Symposium, September 1978, convened jointly by IIASA and IAHS. IAHS-AISH Publication No. 125, Office of Treasurer, IAHS, 1909 K Street NW, Washington, DC., 1978. (383 p,) 155 fig, 48 tab, 397 ref.

Descriptors: *Water quality, *Mathematical models, *Water management(Applied), *Optimization, *Simulation analysis, *Analytical techniques, *Hydrologic cycle, Rivers, Lake, Reservoirs, Estuaries, Economic efficiency, Systems analysis, Equations, Hydraulics.

Important progress has been made in recent years in the application of systems methodology to modeling the quality of water in the hydrological cycle. Many papers on these problems have been presented at various international symposia and seminars, such as those held in Warsaw (1971), Bratislava (1975), and Amsterdam (1977. Hydrophysical and ecological modeling of water bodies, as well as a survey on water quality modeling, are part of the research program of the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. Modelling the Water Quality of the Hydrological Cycle is the proceedings of an international symposium convened jointly by IIASA and IAHS (The International Association of Hydrological Sciences), due to the increasing interest in this subject. Held in Baden, Austria during September of 1978, over 30 papers were delivered, covering the following fields: (1) modeling water quality processes in rivers and estuaries; (2) modeling water quality processes in lakes and reservoirs; 83) modeling groundwater quality processes; and (4) water quality management. Numerous physical simulation modeling techniques and economic optimization methods are presented. Dealt with are such problems as those concerning waste water treatment, activated sludge, water quality control, inter-basin transfer, water networks, water resources development, streamflow forecasting, mocropollutant transport, two-dimensional mixing, eutrophication, shallow water bodies.
W79-00379

STORMWATER MODELING,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
D. E. Overton, and M. E. Meadows.
Academic Press, New York, N.Y., 1976. 358 p, 171 fig, 66 tab, 203 ref, append.

Descriptors: *Storm water, *Model studies, *Analytical techniques, *Parametric hydrology, *Stochastic processes, *Water pollution, *Kinetics, *Deterministic modeling, Rainfall, Overland flow, Open channel flow, Estimating, Regional analysis, Effects, Urbanization, Evaluation, Estimating, Simulation analysis, Optimization, Sensitivity analysis, Wave theory, Equations, Systems analysis.

Presented are the fundamentals of deterministic, parametric, and stochastic stormwater modeling for those having a basic background in science or engineering. The book was written for an audience concerned primarily with evaluating the effects of land use on stormwater for the purpose of doing feasibility studies, planning, and/or design work. A view is given of present methodologies with illustrative examples. The book considers both quantity and quality, but the focus is mainly on stormwater pollution, and so it is stressed that the transport mechanism for water pollutants is the water itself. After an introduction and discussion of modeling concepts, the section on deterministic modeling considers such aspects as rainfall excess, overland and open channel flow, and kinematic flow approximation and wave theory. Discussed next, under parametric modeling, are model optimization techniques, sensitivity analysis, and the evaluation of effects of urbanization and logging on stormwater and of strip mining on streamflow. The stochastic section deals with stormwater frequency modeling. Discussed finally, under stormwater quality modeling, are the state of the art in stormwater quality modeling, simulating pollutographs and loadographs, and the development of stormwater quality indices. (Bell-Cornell)
W79-00381

TRANSPORT CHARACTERISTICS OF PHOSPHORUS IN CHANNELIZED AND MEANDERING STREAMS,
Everglades National Park, Homestead, FL.
P. C. Rosendahl, and T. D. Waite.
Water Resources Bulletin, Vol. 14, No. 5, p 1227-1238, October 1978. 4 fig, 1 tab, 7 equ, 20 ref.

Descriptors: *Nutrients, *Mathematical models, *Water quality, *Orthophosphate, *Channelization, *Meandering streams, *Kissimmee River Basin(Fla), Equations, Movement, Canals, Runoff, Effects, Numerical techniques, Mathematical transport model, Steady state, Simulation analysis.

Comparisons were made between rates of movement of orthophosphate in a canal and a meandering stream. The meander system had greater algal and macrophyte phosphate uptake rates and lower plankton and sediment release rates compared to the canal. Chemical precipitation and direct rainfall influence on orthophosphate movement were insignificant relative to other terms. The major source of phosphorus to both systems was from upland runoff. The impact of this source was greater on the meandering system due to the smaller channel volume. When secondary effects of meandering were considered such as marsh inundation, the net orthophosphate movement within the meandering channel was less than that for the canel, due to the lower concentrations of phosphorus in marsh effluent waters. Field experiments were conducted to compare the longitudinal dispersion coefficient between a canal and meandering river system; the meandering stream had a dispersion coefficient over 17 times that measured for the canal. Rates of orthophosphate movement were combined into a single mass transport equation, and a numerical solution was obtained. Internal river and canal channel processes were overshadowed by external point source loadings. (Bell-Cornell)
W79-00391

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTATION REPORT,
Battelle Pacific Northwest Labs., Richland, WA.
W. W. Waddel, C. R. Cole, and R. G. Baca.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 923, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., Office of Research and Monitoring, April 1974. 87 p, 62 fig, 10 tab, 10 ref, append.

Descriptors: *Water quality control, *Simulation analysis, *Computer models, *Behavior, *Water pollution sources, *South Platte River Basin(Colorado), Phosphorus, Coliform bacteria, Nitrogen, Biochemical oxygen demand, Algae, Dissolved, Prediction, Dissolved gases, Streamflow, Regression analysis, Winter, Data.

The water quality model PIONEER-I is a steady-state program that simulates the behavior of the following water quality parameters: total nitrogen, total dissolved solids, zinc, dissolved oxygen, carbonaceous biochemical oxygen demand, fecal coliform bacteria, phosphorus, ammonia, nitrite, nitrate, and chlorophyll a. The model was set up on the entire length of the South Platte River from Eleven Mile Canyon Reservoir to its confluence with the North Platte River. In addition, ten major tributaries to the South Platte and a number of smaller streams were modeled. The model was calibrated using flow and water quality data collected on the river in late summer 1971 and winter 1971-72. The model was successfully calibrated to describe dissolved oxygen-biochemical oxygen demand mechanisms and nutrient distributions. Study results have shown that it is practicable to set up and calibrate a mathematical water quality model which considers numerous interactive constituents on a large and complex river basin such as the South Platte. It is recommended that every effort be made to encourage the use of this model by regional and local agencies and groups; it is only through this kind of repeated and continuous use that the model can be refined and developed into a reliable and trusted tool for water resource managers. (Bell-Cornell)
W79-00398

CHARACTERIZATION OF THE RELEASE OF CHRYSOTILE ASBESTOS FROM ASBESTOS-CEMENT DRINKING WATER PIPE,
Illinois Univ. at the Medical Center, Chicago.
W. H. Hallenbeck, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 087, Price codes: A04 in paper copy, A01 in microfiche. PhD Dissertation, 1977. 49 p, 2 fig, 15 tab, 47 ref. OWRT A-071-ILL(3).

Descriptors: *Asbestos cement, *Potable water, *Pipes, Sampling, *Asbestos, Electron microscopy, Lake Michigan, Illinois, Filtration, Water pollution sources, On-site investigations, *Chrysotile, Chicago.

A significant problem in data analysis involved the determination of the distribution of counts of asbestos fibers on a membrane filter. The elucidation of this distribution as Poisson enabled the parametric statistical comparison of 'before' to 'after' water samples. Under the conditions and limitations of this research, no significant release of chrysoltile from asbestos-cement pipe was observed. Preliminary data indicate that drinking water in northeast Illinois may contain chrysotile asbestos ranging from 30,000 to 700,000 fibers per liter.
W79-00435

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT,
Tennessee Univ , Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00447

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTED WATERSHED,
Kentucky University, Lexington, Water Resources Research Institute.
G. B. Coltharp, M. T. Shearer, E. P. Springer, and R. F. Wittwer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 171, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 115, 1978. 67 p, 13 fig, 14 tab, 27 ref. OWRT A-058-KY(1), 14-31-0001-5017 FY 75, 14-34-0001-6018 Fy 76, 14-34-0001-7038 FY 76T, 14-34-0001-7038 FY 77.

Descriptors: *Water quality, Fertilization, *Nutrient cycling, *Nitrate nitrogen flux, Streamflow, *Forest watersheds, Watershed management.

This project was designed to determine the effects of nitrogen fertilization on the quality and quantity of streamflow eminating from an eastern hardwood forest watershed. A 40.67 ha watershed, located in mountainous eastern Kentucky, was aerially fertilized in late April 1975. The forest stand was principally oak, hickory, and yellow poplar, 50-55 years of age in a relatively undisturbed condition. A helicopter applied ammonium nitrate at a rate of 504 kg/ha. Because a large part of applied nitrogen fertilizer ends up in the highly mobile nitrate nitrogen form, this is the principal ion monitored in this study. No effort was made to avoid live streams during application and, consequently, very high levels of nitrate nitrogen were detected (640 mg/l) in streamflow within the watershed. Levels potentially toxic to humans and animals persisted in the streamflow for several days following application. Although elevated concentrations of nitrate nitrogen persisted in streamflow leaving the watershed over a

two year period no algal blooms or excessive growth of aquatic plants were noted. Rather high concentrations of nitrate nitrogen were found in the soils of the watershed, with greatest concentrations in the surface layer (0-5cm), intermediate amounts at 15-20cm, and the lowest concentrations at the 41-46cm depth. The effects of the fertilizer application on soils persisted less than one year in the 0-46cm depth sampled. Analysis of streamflow records indicated a reduction in water yield the first and second growing seasons after treatment.
W79-00448

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS,
Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Department.
For primary bibliographic entry see Field 4C.
W79-00450

FACTORS AFFECTING THE QUALITY OF URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
R. S. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 148, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, June, 1977. 84 p, 14 tab, 10 ref. OWRT A-046-TENN(1), 14-34-0001-7090.

Descriptors: *Urban runoff, Watersheds(Basins), *Water quality, *Urban watersheds, Knoxville(Tenn), *Tennessee, Path of pollutants, Third Creek/watershed, Runoff, *Stormwater.

Results of the analysis of 5 years of stormwater data from 4 urban watersheds indicated that there are two distinct but overlapping groups of contaminants. One group is the minerals and solids which have relatively constant concentrations from storm to storm and heavy metals, nutrients and COD which have decreasing concentration with increasing runoff. Removal is a function of runoff volume and only mildly affected by runoff rate. Pervious areas should not be disregarded in stormwater quality simulation. Hence street surface contaminant models will yield conservative results. It was also found that dustfall (total atmospheric fallout) could account for most of the stormwater pollution.
W79-00456

LEACHING CHARACTERISTICS OF VARIOUS HEAVY METALS, NON-HEAVY METALS AND ANIONS FROM MUNICIPAL SEWAGE SLUDGE ASH,
Connecticut Univ., Storrs.
C. D. Sweeney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 086, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, 1978. 128 p, 38 fig, 18 tab, 10 append, 59 ref. OWRT A-067-CONN(1). 14-34-0001-8007.

Descriptors: *Municipal wastes, *Incineration, *Sludge disposal, *Lagoons, *Leaching, *Heavy metals, *Anions, Chemical properties, Soil contamination, Groundwater, Water pollution sources, *Municipal sewage sludge incinerator ash, *Leaching characteristics, *Landfills, Batch studies, *Lysimeter studies, pH variation.

Qualitative and quantitative leaching characteristics of unquenched municipal sewage sludge incinerator ash were studied with respect to amount of water applied and pH variation. Chemical digestion by wet decomposition of unquenched ash showed high residual concentrations of magnesium, sodium, calcium and potassium. Iron was contained in the highest residual concentration of all heavy metals monitored, with zinc second and chromium, cobalt, copper, manganese, nickel and lead present in lower concentrations. Batch and lysimeter studies were used to examine the eluting of the above cations out of the ash and into the water. In addition sulfur, nitrate and chloride were monitored with sulfate having the highest concentrations. Lysimeter effluent analysis revealed basically similar types of 'immediate washing out' curves for both cations and anions with the exception of calcium, which remained in relatively higher concentrations for a longer period of time before its concentration declined. There were no major secondary peaks in any of the effluent profiles. Batch results paralleled lysimeter results with respect to changes in characteristic effluent concentrations. In addition, batch studies gave indirect information on the ability of the ash to buffer an initially acid effluent.
W79-00459

ARCADIA LAKE WATER-QUALITY EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W79-00463

TOTAL PHOSPHORUS TRANSPORT DURING STORM EVENTS,
West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
F. H. Verhoff, and D. A. Melfi.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE5, Technical Note, p 1021-1026, October 1978. 3 fig, 3 ref.

Descriptors: *River flow, *Phosphorus, *Water chemistry, *Model studies, Mathematical models, Flow, Flow rates, Chemicals, Pollutants, Path of pollutants, Water pollution, Storms, Storm runoff, Rivers, Hydrographs, Chemical concentrations.

The flow of water and total phosphorus was simulated in a stream with different types of total phosphorus transport mechanisms. The results of the simulations were compared with known properties of observed hydrographs and chemographs. It was concluded that the major mechanism required to explain the observed results is one that postulates the resuspension and deposition of total phosphorus from the reaches of the river. Thus, most of the total phosphorus moves through a river reach by moving a finite distance with each high flow event passing through the river. (Sims-ISWS)
W79-00478

SIMPLE MODEL FOR OCEAN OUTFALL PLUMES,
General Dynamics Corp., Pomona, CA.
H. C. Schau.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE5, Technical Note, p 1026-1031, October 1978. 3 fig, 8 ref, 1 append.

Descriptors: *Outfall sewers, *Sewage disposal, *Oceans, *Mathematical models, Jets, Outlets, Theoretical analysis, Model studies, Buoyancy, Mixing, Distribution patterns, Spatial distribution, *Outfall plumes.

Ocean outfall systems provide many coastal communities with an economical means of sewage disposal that requires only primary sewage treatment. It is desired to have the effluent as dilute as possible when it reaches the surface. It is known that the amount of mixing is generally affected by the mass flow rate at the outfall system exit, depth, and upward velocity of the effluent (that is a function of exit velocity and density stratification in the seawater). It was the desire of this study to provide some working functional relationships between these parameters in the prediction of dilution in an ocean outfall system. The study centered around a model which assumes that the entrainment is uniquely related to the local excess momentum flux. It was shown that a power law model provides a simple technique for predicting the dilution as a function of depth, for depths characteristic of most outfall systems (20 ft to 200 ft). In particular, it was found that for depths greater than 20 ft, the dilution varies as the 5/3 power of the depth and initial mass flow rate has to first order an additive effect to the solutions given for m sub o = 0. Such solutions are accurate to better than 5% on the average and are meant to augment the results of Fan and Brooks and to provide the working engineer with a simple method for performing preliminary studies without elaborate numerical or graphical solutions. (See also W69-08424) (Humphreys-ISWS)
W79-00479

RELATIONSHIP OF RAINFALL AND LAKE GROUNDWATER SEEPAGE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
J. A. Downing, and J. J. Peterka.
Limnology and Oceanography, Vol. 23, No. 4, p 821-825, July 1978. 1 fig, 1 tab, 9 ref.

Descriptors: *Rainfall, *Lakes, *Groundwater movement, *Seepage, Nutrients, Nitrogen, Nitrogen compounds, Phosphorus, Phosphorus compounds, Groundwater, Recharge, Groundwater recharge, Natural recharge, Specific conductivity, Chlorides, Alkalinity, Sampling, Surveys, Chemical analysis, Limnology, Groundwater inflow.

Correlations were found between mean daily rainfall and groundwater inflow rate and between the rate of groundwater inflow and N and P inflow to a senescent lake during summer. A simple method of collecting and measuring groundwater inflow was reproducible at very low inflow rates. The water collected by this method was similar in P concentration to groundwater, but higher in N concentration. (Sims-ISWS)
W79-00489

CONTINUOUS SIMULATION OF NONPOINT POLLUTION,
Ramlit Associates, Berkeley, CA.
Y. J. Litwin, and A. S. Donigian, Jr.
Journal Water Pollution Control Federation, Vol. 50, No. 10, p 2348-2361, October 1978. 9 fig, 26 ref.

Descriptors: *Water pollution, *Water pollution sources, *Sediments, *Model studies, Mathematical models, Simulation analysis, Computer models, Land use, Planning, Runoff, Water quality, Pollutants, Path of pollutants, Analytical techniques, *Nonpoint pollution, Nonpoint water pollution sources.

Accurate information about the characteristics and the magnitude of nonpoint pollution sources is difficult to establish because (1) pollution varies by orders of magnitude from one watershed to another and from one storm to the next; (2) quantitative information about nonpoint pollution is scarce; and (3) the reported surveys are often incompatible in sampling procedures, analytical techniques, and measured parameters. This paper reviewed briefly the various modeling techniques available for the assessment of nonpoint pollution and discussed their limitations as analytical tools. The recently developed Nonpoint Source Pollutant Loading (NPS) Model was presented. It is based on continuous simulation of hydrologic processes and mechanisms of pollutant accumulation, generation, and transport from the land surface. (Sims-ISWS)
W79-00493

5C. Effects Of Pollution

NUTRIENT LOADING/LAKE TROPHIC CONDITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSHING RATE,
Maine Univ. at Orono.
M. L. Hutchins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 644, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, May 1977. 93 p, 24 fig, 2 tab, 44 ref, 7 append. C-7232(6230)(1). 14-34-0001-6230.

Descriptors: Biomass, Chlorophyll, Lakes, *Phosphorus, Secchi disks, Washouts, *Trophic level, *Model studies, *Eutrophication, Water pollution effects, Algal growth kinetics, *Flushing rate, *Nutrient loading, *Trophic state models.

A nutrient loading/lake trophic state model was developed into which algal growth kinetics were incorporated. Contrary to many past lake modeling efforts, this work described in-lake biomass concentrations instead of in-lake total phosphorus concentrations. The use of growth kinetics allowed flushing rate to become an important parameter for defining lake trophic state. For a given volumetric phosphorus loading, a critical flushing rate was identified beyond which lake washout was predicted to occur. For a phosphorus input concentration of 0.010 g/m3, washout was predicted to occur at a flushing rate of about 45 year-1. The exact value of critical flushing rate was influenced by the values of the kinetic parameters, the maximum specific growth rate, and the half-saturation constant. At low flushing rates both lake biomass and in-lake total phosphorus could be used equally well as indicators of lake trophic state. At high flushing rates, however, biomass was found to deviate substantially from total phosphorus; thus biomass was more representative of lake trophic state than was total phosphorus. Because of this, it is anticipated that biomass will provide a better correlation between secchi disc and chlorophyll a. In application, the model defines actual lake trophic state equally as well as some previous models and, in addition, it has the capacity to describe lake washout conditions.
W79-00001

DEVELOPMENT OF A MANOMETRIC FISH BIOASSAY TECHNIQUE FOR WATER POLLUTION,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W79-00008

EFFECTS OF MUNICIPAL SEWAGE EFFLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
J-P. Moreau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 596, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, April 1977. 76 p, 9 fig, 3 tab, 78 ref, 9 append. OWRT B-048-NY(3).

Descriptors: *Waste water irrigation, Effects, *Earthworms, *Trace metals, Effluents, Municipal wastes, Soil organisms, Soil profile, Research, Projects, Evaluation, Ecosystems, Biological systems, Food chains.

Specific study objectives include: (1) to determine the effect of wastewater irrigation on the concentration of trace metals (Cd, Cu, Pb, Zn) in earthworms collected from three different habitats--an old field community, a reed canary grass field, and a mixed oak hardwood forest; and (2) to determine the effect of wastewater irrigation on the ratio of organic carbon to nitrogen in the soils of the three different vegetative habitats. Spray-irrigation of treated municipal wastewater is a viable alternate method of disposal. Recent investigations at Pennsylvania State University have shown that effluent irrigation increased populations of earthworms while suppressing populations of other soil organisms. On irrigated sites, earthworms may be performing a vital role in the decomposition of organic matter in the soil profile. Therefore, the assessment of any toxicological problems detrimental to this group of animals is of major importance. Examined herein is the effect of trace metals contained in the applied sewage effluent and the resultant metal content of the earthworms.
W79-00009

THE EFFECTS OF HEAVY METALS ON ALGAE POPULATIONS IN A SOUTH CENTRAL RESERVOIR,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
R. L. Meyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 835, Price codes: A06 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, Pub No 61, 1978. 90 p, 3 tab, 33 fig, 79 ref. OWRT A-041-ARK(1).

Descriptors: *Heavy metals, *Algae, Reservoirs, *Seasonal, Lakes, *Arkansas, *Lake Fayetteville(Ark), *Trace elements, Iron, Manganese, Cobalt, Copper, Lead, Zinc, Nutrients, Systematics, Water pollution effects.

This investigation examines seasonal variations of algal assemblages in Lake Fayetteville, in an attempt to evaluate the role of various trace elements in relation to these seasonal variations. Iron, manganese, cobalt, copper, lead, and zinc concentrations were evaluated from March, 1976 to March, 1977 with concomitant examination of algal assemblages. Also, correlations between specific taxa and metals in the water fraction were evaluated. A detailed literature review dealing with the role of micronutrients in various algal groups has been discussed, further evaluation and amplification of data and additional physicochemical parameters, are presented.
W79-00011

ECOLOGICAL SYSTEM AND METHOD,
For primary bibliographic entry see Field 5G.
W79-00021

AQUATIC BIOTAL MONITOR,
Tereco Corp., College Station, TX. (Assignee).
For primary bibliographic entry see Field 5A.
W79-00033

UPTAKE AND FATE OF DI-2-ETHYLHEXYL PHTHALATE IN AQUATIC ORGANISMS AND IN A MODEL ECOSYSTEM,
Illinois Univ. at Urbana-Champaign Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 5B.
W79-00061

ACUTE AND CHRONIC ORAL TOXICITY OF CHLROINATED DIBENZOFURANS TO SALMONID FISHES,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko, D. J. Wildish, O, Hutzinger, and P. M. K. Choi.
Environmental Health Perspectives, Experimental Issue, No. 5, p 187-189, 1973. 2 fig, 3 tab, 5 ref.

Descriptors: *Toxicity, *Mortality, *Atlantic salmon, *Brook trout, Juvenile growth stage, Orgaic compounds, Polychlorinated biphenyls, Aroclors, Fish physiology, Path of pollutants, Chemical properties, Gas chromatograhy, *Dibenzofurans, *Tissue analysis, Bioaccumulation, *Toxicity testing.

A median mortality of 120 + or - 30 days occurred among juvenile Atlantic salmon, fed dry fish food containing 2.7, 5.7, 2.8, and 9.1 Microg/g wet weight of 2,8-di-, tri-, tetra- and octachlorodibenzofuran respectively. Only octachlorodibenzofuran was detected in the dead fish. The fate of the lower chlorinated dibenzofurans was not known and additional experiments, described in this paper, were carried out with immature brook trout fed relatively high levels of 2,8-dichlorobenzofuran. (EIS-Deal)
W79-00062

THE TOXICITY OF PHTHALATES TO THE MARINE DINOFLAGELLATE GYMNODINIUM BREVE,
Texas A and M Univ., Galveston. Dept. of Marine Sciences.
W. B. Wilson, C. S. Giam, T. E. Goodwin, A. Aldrich, and V. Carpenter.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 149-154, 1978. 7 tab, 3 ref.

Descriptors: *Toxicity, *Gymnodinium, Dinoflagellates, Aquatic algae, Organic compounds, Chemical properties, Marine algae, Acids, Chemical analysis, Mortality, Hydrogen ion concentration, *Phthalates, *Toxicity testing, *Esters, Red-tide.

The acute toxicity levels of seven phthalate compounds to Gymnodinium breve (the fish-killing blooms of which are popularly known as 'red tide') were determined by subjecting culture portions of this organism to various concentrations of these compounds. The compounds tested were dimethyl phthalate (DMP), di-n-butyl phthalate (DBP), diethyl phthalate (DEP), di-(2-ethylhexyl) phthalate (DEHP) di-n-propyl phthalate (DPP), potassium hydrogen phthalate and phthalic acid, disodium salt. TLM96 and EC50 data were reported for DEP, DPP, DBP, and DMP. (EIS-Deal)
W79-00063

THE TOXICITY OF MANGANESE ETHYLENEBISDITHICCARBAMATE TO THE ADULT NEWT, TRITURUS CRISTATUS,
Milan Univ. (Italy). Lab. di Zoologia.
N. P. Zaffaroni, E. Arias, G. Capodanno, and T. Zavanella.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 261-267, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Toxicity, *Newts, *Fungicides, Organic compounds, Chemical properties, Path of pollutants, Amphibians, Animal pathology, Animal physiology, Animal metabolism, Respiration, Cytological studies, Mortality, Biological membranes, *Tissue analysis, Manganese ethyledisdithiocarbamate, Mameb.

The toxicity of ethylenebisdithiocarbamate (maneb), a widely used agricultural fungicide, to the adult newt was evaluated after percutaneous exposure. Maneb was lethal to all the animals at the 50 ppm level within fifteen days. Male newts seem to be less resistant to the toxicant than females. At concentrations as low as 25 ppm all males died within 25 days, whereas some of the females were still alive after 5 months. Microscopic examination showed that the skin and the kidney were the most severely affected organs. It has been hypothesized that an osmoregulatory breakdown and an impairment of cutaneous respiratory exchanges play a role in the death of the animals. Renal failure must also be taken in account. However, additional mechanisms can not be ruled out at present. (EIS-Deal)
W79-00064

TOXICITY OF THE FUNGICIDE CAPTAN TO THE DUNGENESS CRAB CANCER MAGISTER,
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
R. S. Caldwell, D. A. Armstrong, D. U. Buchanan, M. H. Mallon, and R. E. Millemann.
Marine Biology, Vol. 48, p 11-17, 1978. 5 fig, 2 tab, 14 ref.

Descriptors: *Crabs, *Toxicity, *Fungicides, *Pesticide toxicity, Larval growth stage, Growth stages, Mortality, Animal metabolism, Animal physiology, Organic compounds, Water pollution effects, Path of pollutants, Chemical properties, Degradation(Decomposition, Bioassay, Life history studies, *Toxicity testing, *Captan

Because of the relatively low toxicity of captan to crab stages and its high rate of degradation in seawater, it is suggested that the agricultural application of captan near marine waters is not likely to affect natural crab populations or crabs in laboratory culture. Furthermore, the prophylactic use of captan as a fungicidal treatment for Lagenidium sp. in larval crab cultures is considered safe when used at recommended dosages. (EIS-Deal)
W79-00065

STUDIES ON THE PATHWAYS AND EFFECTS OF CADMIUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Kiel Univ. (West Germany). Inst. fuer Meerekunde.
For primary bibliographic entry see Field 5B.
W79-00066

UPTAKE OF AMERICUM-241 BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
For primary bibliographic entry see Field 5B.
W79-00067

ECOLOGY OF DREISSENA POLYMORPHA (PALL.) (DREISSENIDAE, BIVALVIA) IN LAKES RECEIVING HEATED WATER DISCHARGES,
Polish Academy of Sciences, Poznan (Poland). Inst. of Applied Zoology.
S. Kornobis.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 4, p 531-545, 1977. 7 fig, 4 tab, 22 ref.

Descriptors: *Mollusks, *Heated water, *Animal populations, Ecology, Lakes, Population, Biological communities, Water pollution effects, Water temperature, Plankton, Larvae, Larval growth stage, Growth rates, Animal physiology, Trophic level, Biomass, *Thermal pollution, *Dreissena.

Investigations on the ecology of Dreissena polymorpha were carried on from 1973 to 1975 on a complex of heated lakes situated in the neighborhood of Konin in Wielkopolska. It was found that the population from heated lakes shows many changes in relation to the ordinary ones. The main differences are: shallow occurrence of the population in the heated lakes; prolongation of larvae occurrence in the plankton; distinct differentiation of the growth rate of the sedentary specimens in relation to the occurrence site; and in the shortening of life of sedentary specimens. Some fragmentary observations concerning the role of D. polymorpha in trophic relations in the heated lakes are also presented. (EIS-Deal)
W79-00068

CONTINUOUS STANDARD WATER DELIVERY SYSTEM FOR BIOASSAYS WITH AQUATIC ORGANISMS,
Rijksinstituut voor Drinkwater-voorziening, Leidschendam (Netherlands).
For primary bibliographic entry see Field 5A.
W79-00073

ADAPTATIONS AND RESISTANCE TO ANOXIA IN CLOEON DIPTERUM (EPHEMEROPTERA) AND NEMOURA CINEREA (PLECOPTERA),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5G.
W79-00076

TRANSURANIC NUCLIDES IN PLAICE (PLEURONECTES PLATESSA) FROM THE NORTH-EASTERN IRISH SEA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5B.
W79-00077

TOXICITY OF SODIUM PENTACHLOROPHENATE (NA-PCP) TO THE GRASS SHRIMP, PALAEMONETES PUGIO, AT DIFFERENT STAGES OF THE MOLT CYCLE,
University of West Florida, Pensacola. Faculty of Biology.
P. J. Conklin, and K. R. Rao.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 275-279, 1978. 1 tab, 18 ref.

Descriptors: *Toxicity, *Shrimp, *Sodium compounds, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, Growth stages, Organic compounds, Phenols, Crustaceans, Bioassay, Animal physiology, Chemical properties, *Pentachlorphenol, *Toxicity testing, *Molting, *Biocides.

The LC50 values obtained for the intermolt and early premolt shrimp were similar. Substantially lower LC50 values were noted for late premolt animals at all exposure times. Visual observations indicated that for late premolt animals mortalities occurred shortly after they molted. If the animals were able to survive about the first six hours following the molt, they generally survived the test. No deaths were recorded for control animals during the 96 hour tests. (EIS-Deal)
W79-00078

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET,
Food and Drug Administration, Washington, DC. Div. of Chemistry and Physics.
For primary bibliographic entry see Field 5A.
W79-00080

THE EFFECT OF NAPHTHALENE ON SURVIVAL AND ACTIVITY OF THE AMPHIPOD PARHYALE,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
W. Y. Lee, and J. A. C. Nicol.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 233-240, 1978. 6 fig, 2 tab, 6 ref.

Descriptors: *Toxicity, *Mortality, *Oil, *Amphipoda, Biochemical oxygen demand, Organic compounds, Aromatic compounds, Animal physiology, Animal metabolism, Animal behavior, Water pollution effects, Oil pollution, Laboratory tests, *Naphthalenes, *Toxicity testing.

Experiments with a closed system show that naphthalene has a deleterious effect on Parhyale at a concentration beginning at 3 ppm, at which most of the animals recovered. Much higher levels of naphthalene (2 or 3x) were required to kill Parhyale in open vessels compared with closed containers for a 24h exposure. A persistent damaging effect was found in some of the survivors from both open and closed systems, this effect appeared at much lower concentrations among the survivors from the closed vessels. Under natural conditions these debilitated animals would be vulnerable because they could not move about or feed. (EIS-Deal)
W79-00081

GROWTH AND DIETS OF TROUT FROM CONTRASTING ENVIRONMENTS IN A GEOTHERMALLY HEATED STREAM: THE FIREHOLE RIVER OF YELLOWSTONE NATIONAL PARK,
Montana State Univ., Bozeman. Dept. of Biology.
L. R. Kaeding, and C. M. Kaya.
Transactions of the American Fisheries Society, Vol 107, No 3, p 432-438, 1978. 3 fig, 1 tab, 28 ref.

Descriptors: *Fish physiology, *Growth rates, *Brown trout, *Rainbow trout, *Geothermal studies, Seasonal, Food habits, Fish behavior, Fish food organisms, Fish populations, Caddisflies, Thermal water, Fish diets, Water temperatures, Aquatic environment.

Differences in seasonal patterns of growth, length at age, and diet were evident between brown trout residing in geothermally heated and unheated sections of the Firehole River. Maximum temperatures at the warmest station exceeded 28C and averaged about 10.5C higher than the unheated station throughout the year. Scale characteristics indicated that brown trout from the heated stations had two annual growth periods while those from the unheated station had one, relatively short, annual growth period. Brown trout from the heated stations were significantly longer at any particular age than those from the unheated station. Caddisflies were the numerically dominant food in the unheated water while trout at the heated station fed most extensively on dipterans, molluscs, and mayflies. Additionally, trout in the unheated water fed mainly on immature benthic insects while those at the heated station fed heavily on emerging insects and exhibited considerably greater numbers of organisms per stomach. Rainbow trout numerous only at the heated station, had seasonal growth pattern, length at age, and diet similar to those of brown trout at this station. (EIS-Deal)
W79-00082

EFFECTS OF FEEDING AND OF CHEMICAL STIMULATION ON THE OXYGEN UPTAKE OF NASSARIUS RETICULATUS (GASTROPODA: PROSOBRANCHIA),
Dundee Univ. (Scotland). Dept. of Biological Sciences.
M. Crisp, J. Davenport, and S. E. Shumway.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 387-399, 1978. 8 fig, 12 ref.

Descriptors: *Oxygen, *Respiration, *Gastropods, *Snails, Animal behavior, Food habits, Absorption, Animal physiology, Oxygen requirements, Animal metabolism, Enzymes, Chemicals.

Exposure to food odours causes an increase in oxygen uptake by Nassarius reticulatus. The response is immediate and lasts between 1/4 and 1/2 h. When snails have fed, oxygen uptake remains elevated for 2-3 days. The duration of elevated rates of oxygen uptake parallels the duration of the behavioral effects of feeding. (EIS-Deal)
W79-00083

FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II,
American Museum of Natural History, Placid, FL. Archbold Biological Station.
J. N. Layne, J. A. Stallcup, G. E. Woolfenden, M. N. McCauley, and D. J. Worley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 456, Price codes: A99 in paper copy, A01 in microfiche. Also available as PB-278 457, Price codes: A99 in paper copy, A01 in microfiche. September 1977.

ne I - 643 p, 123 fig, 34 tab, Volume II - 635 p, g, 7 tab. 14-16-0009-77-005.

riptors: *Water pollution effects, sphates, *Florida, *Mine wastes, *Fish, dlife, *Ecology, Environmental effects, Cen- Industrial pollution, Industrial wastes, nce of nature, Vegetation effects, Habitats, lation, Ecosystems, Climate, Geology, rology, Land use, Soil types, Data collections, onal analysis.

potential impact of phosphate mining and its ciated industrial processes on the fish and wil- within seven central Florida counties, rlotte, DeSoto, Hardee, Hillsborough, Polk, atee, and Sarasota) is examined. Principal ob- ves were: (1) to compile available data on fish wildlife, including an accurate list of species vn to occur in the region, their distribution, ats, and population levels; (2) to use this data sess the potential direct and indirect impacts nosphate mining on individual species and on onal fauna as a whole; (3) to recommend nods of mining or reclamation, mining regula- , and other asspects of the phosphate industry inimize adverse effects on fish and wildlife; (4) to identify significant information gaps and s for additional studies. The scope of the wil- inventory includes all vertebrate groups, es, amphibians, reptiles, birds, and mammals, vell as selected invertebrates. Emphasis is ed on priority species, such as those on the and endangered species lists, those of com- cial or sport value, and those of particular in- st because of scientific importance or useful- as indicators of environmental conditions. o included is a survey of the physical nature of area itself, such as climate, geology, soil types, rologic units, vegetation distribution, and loca- s of phosphate company holdings and impor- sanctuaries, wildlife refuges, and preserves. jtenyi-IPA)
9-00100

METHOD OF MEASURING BACTERIAL OWTH IN AQUATIC ENVIRONMENTS NG DIALYSIS CULTURE,
as Tech Univ., Lubbock. Dept. of Microbiolo-

primary bibliographic entry see Field 5A.
9-00109

MBRANE CONCENTRATION OF INFEC- OUS BOVINE RHINOTRACHEITIS VIRUS OM WATER,
rth Dakota State Univ., Fargo.
t. Tschider, D. L. Berryhill, and I. A. Schipper.
plied Microbiology, Vol. 28, No. 6, p 1030-1032, c. 1974, 1 fig, 1 tab, 11 ref. OWRT-B-022- AK(2), 14-31-0001-3923.

scriptors: *Viruses, Methodology, *Membrane cesses, *Membrane adsorption procedure, fectious bovine rhinotracheitis virus, Cellulose rate membrane filters, Herpesvirus, Elution, al calf serum, Sonic treatment.

membrane adsorption procedure was used to ncentrate infectious bovine rhinotracheitis virus m 1-liter quantities of distilled water. Cellulose rate membrane filters (0.45-microgram pore e) efficiently adsorbed this herpesvirus from ter, and virus was recovered from the mem- ne by elution with 10 ml of fetal calf serum dur- sonic treatment. The average recovery rate s 70 percent.
9-00148

R. /HANSON ;I. A. /SCHIPPER
rth Dakota State Univ., Fargo. Dept. of Veteri- y Science.
e American Journal of Veterinary Research, l. 37, No. 6, p 707-708, June 1976, 2 fig, 1 tab, 11 . OWRT-B-022-NDAK(3), 14-31-0001-3923.

Descriptors: *Viruses, Methodology, *Viral recovery rates, *Infectious bovinre rhinotracheitis, *Swab materials, Cotton, Polyester, Calcium, Alginate wool.

The recovery rates of infectious bovine rhinotracheits virus from swab materials were compared. The adsorptive and elutive properties of cotton, polyester, and calcium alginate wool were examined by direct exposure of infectious bovine rhinotracheitis virus to swab materials in buffered tissue culture medium. Calcium alginate wool was virucidal; this was apparent after 2 hours' exposure. Cotton and polyester swab materials exhibited little virucidal effects. The addition of wooden applicator sticks with the swab materials reduced viral titers further.
W79-00150

THE ENVIRONMENTAL EFFECTS OF CHROMIUM IN TANNERY EFFLUENTS,
Barrie Tanning Ltd. (Ontario).
S. A. J. Shivas.
Journal of the American Leather Chemists Association, Vol. 73, No. 8, p 370-377, August, 1978. 1 tab, 14 ref.

Descriptors: *Chromium, *Tannery wastes, *Solubility, *Toxicity, *Chemical properties, Chemical precipitation, Ion exchange, Biological treatment, Activated sludge, Soils, Leaching, Permeability, Membrane processes, Movement, Waste water treatment, Industrial wastes.

The physico-chemical properties of trivalent chromium, present in tannery effluents, were examined with respect to treatment, disposal, and ultimate environmental effects. The potential was very low for reverse oxidation of trivalent chromium to the highly toxic hexavalent chromium by aerial oxidation or pH increases above 4. Cr(III) was precipitated at pH 5-12; the chromite ion formed above pH 12 required manganese ions as a catalyst for oxidation. Cr(III) usually forms in soluble complexes, reducing its potential for leaching into subsoils or groundwater from land-applied sludges. The limited mobility of the triply-charged cation and its aggregation with proteins and other colloids imparted poor membrane permeability to chromium. Complexed Cr(III) in tannery effluent will precipitate with primary sludge and will adsorb on biological flocs in the activated sludge process. The presence of high levels of Cr(III) during biological treatment has been found to reduce the degree of nitrogen breakdown, hinder microbial degradation, and inhibit oxygen absorption by sludge microorganisms. While Cr(III) levels of 300 mg/liter in digesters have been tolerated at retention times longer than 20 days, levels in the feed to a municipal treatment plant were not expected to exceed 10 mg/liter; Cr(III) was found to artificially suppress BOD values. When applied to soils, Cr(III) exhibited an initial toxic effect on microorganisms; chromium was readily immobilized when applied to soils having a moderate to high ion exchange capacity. (Lisk-FIRL)
W79-00156

WATER HARDNESS AND CARDIOVASCULAR MORTALITY,
Ottawa Univ. (Ontario). Dept. of Epidemiology and Community Medicine.
L. C. Neri, and H. L. Johansen.
Annuals of the New York Academy of Sciences, Vol. 304, p 203-219, March 30, 1978. 5 fig, 11 tab, 94 ref.

Descriptors: *Hardness, *Water quality, *Hypertension, *Cardiovascular mortality, Soft water, Magnesium, Cadmium, Canada.

There is a lack of agreement among researchers as to the geographic relationship between water quality and cardiovascular mortality. The presence of lead, cadmium, sodium, nitrates, and the lack of calcium and magnesium in soft water areas are thought to be associated with hypertension and increasing mortality but no definite conclusions have been reached. Several criteria are proposed for judging whether an element is associated with hypertension. They are: Its concentration in water supplies must follow the geographic distribution of water hardness; Its postulated effect has to be consistent with the geographic variation in cardiovascular mortality; Its concentration in drinking water, compared to other sources, must be sufficient to exert the postulated effect. In a recent autopsy study of elements in the myocardium of residents of hard and soft water areas, magnesium was the only one which indicated a pattern by being: More abundant in hard than in soft water areas, More abundant in the myocardium of healthy subjects than of those with heart disease, More abundant in the myocardium of hard water residlents than of soft water residents. Lastly, its concentration in water shows the strongest negative correlation with mortality due to all causes. (Purdin-NWWA)
W79-00171

THE PHOTOSYNTHETIC AND RESPIRATORY RATES AND TOLERANCES OF BENTHIC ALGAE FROM A MANGROVE AND SALT MARSH ESTUARY: A COMPARATIVE STUDY,
University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes, R. E. Moon, and M. A. Davis.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 175-185, February 1978. 5 fig, 2 tab, 30 ref.

Descriptors: *Salt marshes, *Mangrove swamps, *Photosynthesis, *Respiration, *Algae, Benthic flora, Seaweeds, Florida, Weeki Wachee River(FL), Cockroach Bay(FL), Estuaries, Salinity, Dessication, Light chlorophyll, Temperature, Intertidal areas, Subtidal areas, Bostrychia binderi, Gracilaria verrucosa, Cladophora repens, Acanthophora spicifera, Catenella repens, Spyridia filamentos, Rhodophyta.

Comparative examination of net photosynthetic and respiratory rates of dominant red and green algae from a salt marsh and from a mangrove community on Florida's west coast showed higher chlorophyll levels among salt marsh algae. Two subtidal and two intertidal species were selected from each site. Optimal temperatures, light intensities, and salinities for the species were compared and effects of dessication on the intertidal species were studied. Net photosynthetic and respiratory rates were similar for both intertidal species from each site, and they showed broad tolerances to salinity with positive photosynthetic responses even when held in distilled water for three days. All intertidal species, monitored in the air as well as submerged, had high photosynthetic rates after dessication periods of four, eight, or sixteen hrs/day for three days. Peak photosynthetic rates for all species occurred at 11,200 microW/sq cm white light at 30-36C and 20-30% salinity. Subtidal algae in the mangrove community had photosynthetic rates 5-10 times higher than in the salt marsh. In the salt marsh, located at the mouth of the Weeki Wachee River, intertidal species studied were Bostrychia binderi and Catenella repens, and subtidal species were Gracilaria verrucosa and Spyridia filamentosa. In the mangrove community at Cockroach Bay intertidal species were Bostrychia binderi and Cladophora repens, and subtidal species were Gracilaria verrucosa and Acanthophora spicifera. (Lynch-Wisconsin)
W79-00204

AN INVESTIGATION OF PRIMARY PRODUCTION AND ECOSYSTEM METABOLISM IN A LAKE MICHIGAN DUNE POND,
Michigan State Univ., East Lansing. Dept. of Botany.
J. W. Barko, P. G. Murphy, and R. G. Wetzel.
Archiv Fur Hydrobiologie, Vol. 81, No. 2, p 155-187, November 1977. 7 fig, 6 tab, 77 ref. ERDA E(11-1)-1599, (COO-1599-94) (ORD-13999, 4282).

Descriptors: *Primary productivity, *Ponds, *Dunes, *Metabolism, *Algae, *Macrophytes, *Phytoplankton, *Epipelic algae, Ecosystems, Lake Michigan, Carbon radioisotopes, Respiration, Carbon dioxide, Juncus balticus, Photosynthesis, Seasonal, Distribution, Biological communities, Aquatic plants, Trophic level, Michigan.

Net primary productivity of phytoplankton, epipelic algae, and macrophytes in a small (0.25 ha) pond in the sand dunes along Lake Michigan near the Kalamazoo River delta, Michigan, were estimated on an annual basis, along with estimates of gross assimilation and ecosystem respiration. Total net primary productivity (TNPP) was 348 mg C/sq m/day. Macrophytes accounted for 61% of TNPP, followed by epipelic algae at 26% and phytoplankton at 13%. Gross assimilation (547 mg C/sq m/day) exceeded ecosystem respiration (377 mg C/sq m/day). The P/R ratio, estimated at 1.45, indicated potential accrual of organic carbon at 169 mg C/sq m/day, net ecosystem production. Annual assimilatuion efficiency was estimated at 0.42%, and growth efficiency at 64%. In situ carbon-14 fixation determined net phytoplankton and epipelic algae primary productivity, and harvest techniques were used for macrophyte productivity. Gross assimilation and ecosystem response estimates were based on carbon dioxide flux measurements made in portable light and dark metabolism chambers enclosing portions of the pond. Laboratory measurements of photosynthesis using the dominant macrophyte, Juncus balticus, were used to interpret seasonal photosynthesis patterns observed in the field. The pond was autotrophic (P/R 1.0) during summer and heterotrophic (P/R 1.0) in winter. Seasonal distribution and productivity of the algae are discussed. (Lynch-Wisconsin)
W79-00205

WATERHYACINTH (EICHHORNIA CRASSIPES) NUTRIENT UPTAKE AND METABOLISM IN A NORTH CENTRAL FLORIDA MARSH,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. J. Mitsch.
Archiv fur Hydrobiologie, Vol 81, No 2, p 188-210, November 1977. 10 fig, 4 tab, 34 ref. NSF GK-34232.

Descriptors: *Marshes, *Water hyacinth, *Metabolism, *Lake Alice(FL), *Nutrients, *Water pollution effects, *Nutrient removal, *Path of pollutants, Eichhornia crassipes, Florida, Lakes, Sewage disposal, Tertiary treatment, Cooling water, Heated water, Sediments, Absorption, Phosphorus, Nitrogen, Water temperature, Primary productivity, Beneficial use, Denitrification.

Effects of high nutrient loading from secondary sewage effluent on the marshy eastern part of Lake Alice, Gainesville, Florida were studied, with special attention to the disposition of nitrogen and phosphorus, and to the metabolism of water hyacinth (Eichhornia crassipes) which dominates the marsh. Construction of an earthen dam in 1948 and addition of the sewage effluent and heated once-through condenser water from a heating plant in 1964 increased the lake's size from four to thirty-three ha. High nutrient levels and water temperatures in the 29-31 range have resulted in gross primary productivity among the highest ever reported--19.3 g C/sq m/day for large hyacinths and 15.6 g C/sq m/day for dwarf hyacinths. Net production efficiencies were about 1.6% of solar insolation for both plants. Uptake of total nitrogen averaged 49% across the marsh. Nitrate showed a seasonal pattern of greater uptake from winter to summer; phosphorus uptake averaged 11% with signs of a net phosphorus export in winter. Rapid nutrient turnover and high water hyacinth metabolism apprarently accounts for the low percentage of nitrogen and phosphorus uptake. Seasonal changes in nitrate levels leaving the marsh suggest denitrification is a significant nitrogen sink, and sediments continue to act as an additional nitrogen source to overlying waters. Use of a hyacinth marsh as a natural tertiary treatment system would require much lower nutrient loading rates to be effective. (Lynch-Wisconsin)
W79-00206

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER DIATOMS,
Cologne Univ. (Germany, F.R.) Botanisches Inst.
B. P. Kremer, and R. Berks.
Zeitschrift fur Pflanzenphysiologie, Vol 87, No 2, April 1978, p 149-165. 12 fig, 2 tab, 26 ref.

Descriptors: *Diatoms, *Photosynthesis, *Carbon radioisotopes, *Metabolism, *Darkness, Algae, Carbon dioxide, Amino acids, Carbon fixation, Assimilation, Kinetics.

Several diatom species taken from marine, brackish, and freshwater habitats were used in laboratory experiments to characterize photosynthesis, photosynthetic carbon assimilation, and carbon fixation in the dark. Dark fixation generally did not exceed 4-5% of photosynthetic carbon-14 incorporation. The assimilate pattern of long-term photosynthesis in Hl4CO3 comprised a complex variety of soluble and insoluble assimilates; considerable amounts of carbon-14 were recovered from several amino acids, particularly glutamate. Relatively little carbon-14 was confined to low molecular weight carbohydrates, such as glucose and fructose. Sucrose or polyhydroxy alcohols (mannitol) were not found to be carbon-14 labelled photosynthates. Appreciable amounts were converted to polymeric constituents, mainly polysaccharides and various lipids, accounting for over 60% of total radioacarbon found in soluble assimilates after long periods of photosynthetic carbon-14-fixation. Short-term photosynthetic carbon-14 incorporation experiments resulted in predominant carbon-14 labelling of phosphorylated compounds (such as 3-phosphoglycerate) and some sugar phosphates, showing the typical time-dependent decrease in percentage of carbon-14 labelling; C4 compounds (including asparate and malate) exhibited very different carbon-14 labelling kinetics. Results suggest that photosynthetic carbon fixation in diatoms does not resemble the C4 pathway but generally follows the Calvin scheme. (Lynch-Wisconsin)
W79-00208

DIVERSITY AND ENVIRONMENTS OF BENTHIC INVERTEBRATE COMMUNITIES IN SOUTH SWEDISH STREAMS,
Lund Univ. (Sweden). Dept. of Animal Ecology.
F. Friberg, L. M. Nilsson, C. Otto, P. Sjostrom, and B. W. Svensson.
Archiv fur Hydrobiologie, Vol 81, No 2, November 1977, p 129-154. 2 fig, 6 tab, 37 ref, 2 append.

Descriptors: Streams, *Lotic environment, *Skane(Sweden), *Invertebrates, *Benthic fauna, *Species diversity, *Sweden, Faunal lists, Data collections, Habitats, Species composition, Distribution, Insects, Seasonal, Ephemeroptera, Plecoptera, Coleoptera, Trichoptera, Ecology, Abundance, Larvae, Verkaan Stream(Sweden), Forsakarsbacken Stream(Sweden), Braan Stream(Sweden), Agricultural runoff.

Three streams in the province of Skane in southern Sweden were sampled for benthic invertebrates in May and October 1974 to study relationships between lotic communities and their environments. Streams sampled were the Verkaan, Forsakarsbacken, and Braan, all of which run through farmland, pastures, and deciduous woodland, and which were selected on the basis of moderately fast current, little silt deposition, sparse macrophyte vegetation, and stony or sandy bottom. Overall, environmental diversification within a given stream was so high that benthic communities were almost as different between sites in a stream as between sites in different streams. Some streams were markedly affected by agricultural pollution and other disturbances. A species list is provided in appendices. The general pattern of species abundance distribution is about log-normal. Different samples from the same locality were more similar to each other than to samples from elsewhere in the same stream or in other streams. Species diversity in one season was uncorrelated with that in another, and the major taxa--Ephemeroptera, Plecoptera, Coleoptera and Trichoptera--varied independently with respect to their local diversity. Few correlations were found between environmental variables and community parameters. Colonization assemblages correlated positively with richness of the surrounding natural community if sufficient number of taxa were included. (Lynch-Wisconsin)
W79-00209

DIEL CYCLES OF INORGANIC NITROGEN UPTAKE IN A NATURAL PHYTOPLANKTON POPULATION DOMINATED BY GONYAULAX POLYEDRA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
J. J. MacIsaac.
Limnology and Oceanography, Vol 23, No 1, January 1978, p 1-9. 6 fig, 1 tab, 28 ref.

Descriptors: *Gonyaulax polyedra, *Phytoplankton, *Diel cycles, *Nitrates, *Ammonium, *Red tide, *Diel migration, Algae, Dinoflagellates, Oceans, Baja California(Mexico), Mexico, Biorhythms, Absorption, Nitrogen, Inorganic compounds, Light, Diatoms, Nutrients, Limiting factors.

Diel uptake rates of N15-labelled nitrate and ammonium by phytoplankton dominated by Gonyaulax polyedra were measured directly in natural populations during a bloom of the dinoflagellate off Punta San Hipolito, Baja California, Mexico in March 1972. To generate uptake rates sufficiently high for these populations to reach bloom proportions, the simultaneous presence of light and inorganic nitrogen (especially nitrate) appeared necessary. Data revealed no significant differences in light requirements between diatoms and dinoflagellates. The apparent paradox of dense populations of dinoflagellates (red tides) occurring in nutrient-depleted surface waters has been observed for many years; possibly, downward migration allows them to take up significant amounts of nutrients in the enriched bottom of the photic zone in the dark. However, field results presented here do not support the hypothesis that dinoflagellates have any special capacity for dark nutrient uptake, nor are special cellular characteristics beyond migration necessary to explain occassions of dinoflagellate dominance. Nevertheless, the dark uptake of nitrate, apparently equally characteristic of starved dinoflagellates and diatoms, plus the migratory capability of dinoflagellates may help to explain the persistence of dinoflagellate blooms after their development. (Lynch-Wisconsin)
W79-00210

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UPTAKE,
New York State Dept. of Health, Albany. Environmental Health Center.
G. Y. Rhee.
Limnology and Oceanography, Vol 23, No 1, January 1978. p 10-25. 12 fig, 2 tab, 73 ref.

Descriptors: *Nitrogen, *Phosphorus, *Limiting factors, *Phytoplankton, *Nitrates, *Plant growth, *Eutrophication, Algae, Nutrients, Scenedesmus, Proteins, Absorption, Carbon, Chlorophyll, Baseline studies, Lakes, Estuaries, Cytological studies, Chemostats.

toplankton growth during the transition veen the nitrogen- and phosphorus-limited es common in lakes and coastal seawaters was estigated in laboratory experiments using nedesmus sp. Emphasis was on changes in cel- r composition because the growth rate (mu) of toplankton as limited by various nutrients is a ct function of the cellular level of the rients. Kinetics of nitrogen-limited growth and ogen uptake were also investigated to provide eline information to be used with previous lings on phosphorus-limited growth and up- e. Scenedesmus sp. was grown in chemostats as xed growth rate in an inorganic medium, with ogen-to-phosphorus atomic ratios (N:P) rang- from 5-80. No additive of multiplicative effect he double nutrient limitation was found; below optimal cell N:P of 30, growth was determined ely by nitrogen limitation, while above 30 wth was dependent on phosphorus limitation. d nitrogen remained constant up to the optimal o and above it increased linearly with N:P. The el of cell phosphorus was high at low N:P, but reased rapidly until N:P approached the op- al and at high N:P remained constant at a low el. Protein was the major fraction in which ex- s nitrogen accumulated under phosphorus itation. Cell free amino acids were a constant portion of cell nitrogen at all N:P ratios. RNA ncentration was the same regardless of N:P, h its level determined by mu. Cell carbon was her in the phosphorus-limited states. (Lynch- sconsin)
79-00211

ASONAL CHANGES IN RESPIRATORY EN- ME ACTIVITY AND PRODUCTIVITY IN KE WASHINGTON MICROPLANKTON,
shington Univ., Seattle. Fisheries Research t.
H. Devol, and T. T. Packard.
nnology and Oceanography, Vol 23, No 1, uary 1978, p 104-111. 3 fig, 1 tab, 46 ref.

scriptors: *Seasonal, *Respiration, *Enzymes, ake Washington(WA), *Eutrophication, hytoplankton, Photosynthesis-respiration ratio, shington, Primary productivity, Lakes, Carbon lioisotopes, Euphotic zone, Microplankton, rk respiration, Photosynthesis, Electron trans- rt system, Nutrients, Phosphates, Stratification.

lculations of cyclical seasonal respiration from ect measurements of electron transport system TS) activity in natural phytoplankton assem- ges are presented for Lake Washington (WA) r January-December 1974. During the first few nths of the year minimum ETS activity (4.2 mg sub eq/sq m/hr), carbon-14 uptake (84 mg C/sq day), and chlorophyll (10.1 mg/sq m), coincided th minimum temperature (about 6.2C) and max- um nutrient concentrations (phosphate, 250 g/sq m; nitrate, 3.5 g/sq m). Maximum ETS ac- ity (109.8 mg 0 sub eq/sq m/hr), carbon-14 up- e (2126 mg C/sq m/day), and chlorophyll (121.7 g/sq m) occurred during spring bloom. During e fall period of thermal stratification and trient depletion, values were intermediate. spiration rates were used to calculate produc- n:respiration ratios (P:R), which were low in e summer and fall and high in winter. The per- ntage of primary production oxidized during a -hr dark period varied from 7-100%, with high rcentages in summer, low in late winter. Dark spiration should be considered in any study of e fate of photosynthetically fixed carbon; 10- % of carbon-14 carbon incorporated by marine gae can be lost in a four-hr dark period. The P:R te has been considered the major single measure the physiological state of phytoplankton popu- tions. (Lynch-Wisconsin)
79-00212

HYTOPLANKTON EXTRACELLULAR ELEASE AND ITS RELATION TO THE SEASONAL CYCLE OF DISSOLVED ORGANIC CARBON IN A EUTROPHIC LAKE,
State Univ. of New York at Fredonia. Environmental Resources Center.
T. A. Storch, and G. W. Saunders.
Limnology and Oceanography, Vol 23, No 1, January 1978, p 112-119. 4 fig, 1 tab, 24 ref.

Descriptors: *Eutrophication, *Seasonal, *Dissolved organic carbon, *Frains Lakes(MI), *Phytoplankton, *Organic matter, *Degradation(Decomposition), Carbon, Michigan, Lakes, Organic compounds, Bacteria, Littoral, Macrophytes, Algae, Photosynthesis.

Phytoplankton extracellular release was not a significant source of dissolved organic carbon (DOC) in eutrophic Frains Lake, near Ann Arbor, Michigan during major fluctuations of total dissolved organic caron (TDOC). Increases in TDOC concentration greatly exceeded amounts accumulated from release by phytoplankton, even when maximum rates of phytoplankton DOC release were calculated by assuming release exclusively from a large intracellular pool not at isotopic equilibrium. Data suggest that 42-98% of total dissolved organic matter input to the pelagial surface waters is derived from other sources; the most important are probably: (1) decomposition of dead phytoplankton, (2) release by littoral primary producers, and (3) decomposition of particulate organic matter in surficial sediments. DOC released from decomposition of algal detritus is estimated to be two to six times that secreted by living phytoplankton in Frains Lake. Release of DOC by littoral macrophytes and associated flora exceeded release from living phytoplankton by more than double in a marl lake. In this study, conducted April-October 1970, TDOC concentrations fluctuated aperiodically. Phytoplankton DOC release and daily bacterial assimilation rates of phytoplankton extracellular DOC also fluctuated markedly. Bacterial utilization of phytoplankton DOC alone could not account for TDOC decreases. (Lynch-Wisconsin)
W79-00213

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., Trenton, NJ. Dept. of Biology.
D. Whigham, and R. Simpson.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 347-351. 2 fig, 1 tab, 21 ref.

Descriptors: *Zizania aquatica var. aquatica, *Wild rice, *Primary productivity, *Biomass, *Plant growth, *Hamilton Marshes(NJ), New Jersey, Marshes, Tidal marshes, Mortality, Delaware River, Wetlands, Marsh plants, Root development, Seeds.

An investigation of wild rice in the Hamilton Marshes on the New Jersey side of the Delaware River April-September 1974 showed very high production rates and high seed production. Net primary production, which varied seasonally, reached July maximum of 20.9 g/sq m/day (0.44 g/plant) following seedling establishment; lowest production rates occurred during the seedling phenophase in May (0.07 g/plant, or 10.2 g/sq m). Productivity declined in late July with the onset of flowering and fruiting, with values of 0.1 g/plant (10.8 g/sq m) in August and September. The highest rate coincided with the period of rapid growth in height, and the decline with the reproductive phenophases, thus wasting minimum energy in shoot and root growth. Potential seed production is estimated at 37,300/sq m. About 65% of biomass was allocated to root production during the seedling phenophase. Population mortality was constant between May and early August. Eight populations of wild rice were sampled during the study in the marshes, the northernmost freshwater tidal wetlands in the Delaware River drainage basin. Seedling densities were determined on May 15, about two weeks after germination; densities were 188 + or - 69 plants/sq m at that time, and biomass averaged 15 g/sq m. (Lynch-Wisconsin)
W79-00214

MORPHOMETRIC CHANGES IN ASTERIONELLA FORMOSA COLONIES UNDER PHOSPHATE AND SILICATE LIMITATION,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
D. Tilman, S. S. Kilham, and P. Kilham.
Limnology and Oceanography, Vol 21, No 6, 1976, p 883-886, 1 fig, 17 ref. NSF GB-41315.

Descriptors: *Asterionella formosa, *Phosphates, *Silicates, *Limiting factors, *Analytical techniques, *Plant morphology, Morphometry, Methodology, Diatoms, Phytoplankton, Algae, Mesotrophy, Bioindicators, Equilibrium, Colonies, Size, Plant growth, Lakes, Nutrients.

Experiments demonstrated that colony size can be used to assess whether a natural population of the planktonic diatom Asterionella formosa is silicate or phosphate limited. At high steady-state growth rates, the cells per colony averaged eight. Under phosphate limitation, the number of cells per colony decreased linearly with decreasing steady-state growth rate to less than two cells per colony at very low growth rates. Under silicate limitation, the number of cells per colony increased exponentially with decreasing steady growth rate in to over 20 cells per colony at very low growth rates. In nature, increases in colony size above eight cells/colony would indicate silicate limitation, and decreases below 6-8 cells/colony would indicate phosphate limitation. A. formosa is a major phytoplankter in mid-latitude mesotrophic lakes and impoundments. An axenic clone of A. formosa isolated from Frains Lake, Michigan, was used in the tests. Cultures were grown at 20C on a 14-10 hr light-dark cycle with illumination of about 100 microein/sq m/sec in medium WC, modified so that either phosphate or silicate would be the limiting nutrient. The population was allowed to grow to steady state in flow-through, semicontinuous cultures. At rates near the maximum rate of growth, Asterionella was barely limited by any nutrient. Because it is unlikely that steady-state conditions prevail in lakes, colony morphology should not be used to estimate the absolute rate of growth of natural Asterionella populations. (Lynch-Wisconsin)
W79-00215

BENTHIC ALGAE IN A POND AFTER THE ACCUMULATION OF BEET-SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
K. Kyselowa.
Acta Hydrobiologica, Vol 19, No 3, p 215-231, 1977. 1 fig, 1 tab, 20 ref.

Descriptors: *Sugar industry, *Water pollution effects, *Benthic flora, *Algae, *Zimowy Wielki Pond(Poland), *Ponds, Sugar beets, *Poland, Industrial wastes, Sediments, Phytoplankton, Species composition, Primary productivity, Chlorophyll, Floral lists, Waste disposal, Photosynthesis, Diatoms, Bottom sediments.

Species composition and primary production of benthic algae were determined for Zimowy Wielki, Poland, a pond which received wastes from a beet sugar factory at nearby Chybie during 1967-72. The study was carried out in 1974, more than a year after waste disposal had stopped. The attached algal community was accompanied by typical pond planktonic algae. The algae were characterized by benthic or epiphytic species of diatoms. Chlorophytes and cyanophytes were also present. Tables list taxa found at the inflow, outflow and center of the pond on seven sampling dates (April-September). Bottom sediment was sampled with a

tube. Specimens are discussed systematically by taxon. Conditions for survival of the epipelic algae, whose habitat is the upper mud layer, appear to be light and mobility. Greatest chlorophyll-a concentration was consistently found at the inflow (527.9 micrograms/g dry wt) or in the middle of the pond (209 micrograms/g dry wt), whereas at the outflow in the deepest part, about two m deep, chlorophyll-a content was lower (11.32-92.0 micrograms/g dry wt). Abundant benthic algae occurred until the beginning of July, sometimes several times greater than in control ponds or even fertilized ones, possibly indicating continuing effects of the sugar beet wastes and a stimulating influence of biogeneous substances in the sediments. (Lynch-Wisconsin)
W79-00216

PHYTOPHILOUS FAUNA IN PONDS FERTILIZED WITH SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
K. Srokosz.
Acta Hydrobiologica, Vol 19, No 3, p 233-242, 1977. 2 fig, 1 tab, 30 ref.

Descriptors: *Sugar industry, *Invertebrates, *Phytophilous fauna, *Species composition, *Dominant organisms, *Eutrophication, *Ponds, *Industrial wastes, Trophic level, *Poland, Sugar beets, Water pollution effects, Zimowy Wielki Pond(Poland), Lakowy Pond(Poland), Gorol Pond(Poland), Zooplankton, Benthic flora, Algae, Benthic fauna, Chironomidae, Ephemeroptera, Glyceria aquatica, Myriophyllum spicatum, Elodea canadensis, Succession.

Settlement of aquatic plants by phytophilous fauna was studied in two Polish ponds which have received wastes from the Chybie beet sugar factory and one control pond. The objective was to determine dominant fauna and assess the relative influence of trophic conditions and of the host plant in controlling settlement. The accumulation pond Zimowy Wielki, the assimilation pond Lakowy, and the control pond Gorol were sampled biweekly April-September 1971; samples were collected from Glyceria aquatica, common to all three ponds, Myriophyllum spicatum in Zimowy Wielki, and Elodea canadensis in Lakowy. Dominant organisms in all ponds and on all plants investigated were larvae of Chironomidae until midsummer and Ephemeroptera (Cloeon gr. dipterum) from midsummer to autumn. About 120 taxa were identified, with the greatest differentiation of taxonomic groups and species in the control pond and the smallest in the accumulation pond Zimowy. In the most enriched pond (Zimowy Wielki) no qualitative or quantitative differences were noted in fauna settling G. aquatica or M. spicatum, and typical subdominant bottom fauna were observed. In less-enriched Lakowy the influence of plants on fauna settling them was evident; Elodea attracted Ablabesmyia gr. monilis and Nymphula nymphaeta, while Glyceria aquatica attracted Glyptotendipes gr. gripekoveni. Pond trophic condition determined dominance of Cricotopus gr. silvestris (more eutrophic), Corynoneura (medium enrichment), and Psectrocladium gr. dilatatus (low enrichment). (Lynch-Wisconsin)
W79-00217

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 1. CHEMISM OF THE RYBI POTOK WATERS AND THE CHLOROPHYLL CONTENT IN ATTACHED ALGAE AND SESTON IN RELATION TO THE POLLUTION,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
M. Bombowna.
Acta Hydrobiologica, Vol 19, No 3, p 243-255, 1977. 4 fig, 2 tab, 27 ref.

Descriptors: *Rybi Potok(Poland), *Water pollution effects, *Sewage disposal, *Water chemistry, *Chlorophyll, Streams, *Eutrophication, *Poland, Tourism, Biocenoses, Mountains, Tatra Mountains, Seston, Algae, Benthic flora, Lake Morskie Oko(Poland), Phosphorus, Limiting factors, Electrolytes, Conductivity, Self-purification.

In the Rybi Potok, a mountain stream in Poland's Tatra National Park sewage pollution from a heavily used tourist shelter was especially reflected in phosphate and ammonia levels, and electrolyte concentrations were extremely low. Sampling was conducted February 1971-June 1972 in a four-km section of the stream. Chlorophyll-a content of attached algae and seston was determined. Phosphates and ammonia were found to limit primary production over the entire section of the stream investigated. The stream, flowing on a granite substratum, showed little seasonal variation in the extremely low concentrations of electrolytes and conductivity. Increase in organic matter due to the sewage was only slightly evident in higher BOD5 and free carbon dioxide chiefly below the sewage inflow, where chloride and sodium concentrations also rose. The nitrate to ammonia ratio suggests very rapid mineralization and nitrification. Increased fertility in the stream resulted in increased chlorophyll content in attached algae on an areal basis. At low water levels self-purification of the Rybi Potok was completed before the stream flowed into small downstream ponds, and at high water levels it was completed shortly below the inflow. (See also W79-00219) (Lynch-Wisconsin)
W79-00218

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 2. BACTERIA AS AN INDEX OF WATER POLLUTION ON THE RYBI POTOK STREAM,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
A. Starzecka.
Acta Hydrobiologica, Vol 19, No 3, p 257-270, 1977. 3 fig, 3 tab, 23 ref.

Descriptors: *Rybi Potok(Poland), *Water quality indices, *Bioindicators, *Bacteria, *Water pollution effects, *Self-purification, *Eutrophication, *Poland, Lake Morskie Oko(Poland), Tatra Mountains, Mountains, Streams, Sewage disposal, Tourism, Heterotrophic bacteria, E coli, Biocenoses, Denitrification, Annual.

Quantitative changes of several physiological groups of heterotrophic bacteria were compared over the annual cycle in polluted and unpolluted sectors of the Rybi Potok, a mountain stream in Poland's Tatra National Park, to develop a pollution index. Heterotrophic bacteria included were proteolytic ammonifying and denitrifying bacteria and Escherichia coli. Based on numerical changes in bacteria a logarithmic comparative coefficient (LCC) was calculated which permitted differentiation of two zones of self-purification in a 3.2-km section of the stream. Rybi Potok stream is contaminated by sewage inflow from a tourist shelter used by over a million persons/yr upstream at Lake Morskie Oko. Six stations were sampled May 1971-June 1972 at 1.5-mo intervals. It is concluded that sewage disturbs the natural biocenosis of the Rybi Potok, but owing to bacterial biochemical action with favorable oxygen conditions (6.7-12.3 mg 02/liter), self-purification processes counteract noxious effects of the sewage in a short section of the stream. Water quality at Station 1, at the source of Rybi Potok at Lake Morskie Oko, can be regarded as pure, while at Station 2 (the sewage inflow) the water contains great numbers of bacteria and may be classified strongly polluted. At Station 1 the influence of natural factors is manifested in one annual peak in bacterial numbers, while at Station 2 two periods of maximum increases suggest the influence of pollutants. (See also W79-00218) (Lynch-Wisconsin)
W79-00219

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 3. ATTACHED ALGAE COMMUNITIES IN THE STREAM RYBI POTOK (THE HIGH TATRA MTS, POLAND) POLLUTED WITH DOMESTIC SEWAGE,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
B. Kawecka.
Acta Hydrobiologica, Vol 19, No 3, p 271-292, 1977. 6 fig, 2 tab, 42 ref.

Descriptors: *Rybi Potok(Poland), *Algae, *Water pollution effects, *Bioindicators, *Diatoms, *Succession, *Eutrophication, *Poland, Streams, Mountains, Tatra Mountains, Benthic flora, Sewage disposal, Tourism, Chrysophyta, Mineralization, Self-purification, Fungi, Biomass, Dominant organisms, Annual, Floral lists, Trophic level, Lake Morskie Oko(Poland), Biocenoses.

The succession of attached algal communities along the course of the Rybi Potok, a mountain stream in Poland's Tatra National Park polluted at its source by sewage from a shelter serving over one million tourists annually, is described. Four areas with characteristic vegetative communities are distinguished: (1) Station 1, an oligotrophic environment above the sewage outlet, dominated by the cyanophyte Calothrix gypsophila, and the diatoms Tabellaria flocculosa, Achnanthes microcephala, A. minutissima, and Synedra ulna. (2) Stations 2 and 3, a highly eutrophic 30-m section below the outlet dominated by the cyanophyte Phormidium favosum, the fungus Leptomitus lacteus, and the diatoms Cymbella ventricosa, Navicula cryptocephala, Nitzschia palea, and Gomphonema spp. (3) Stations 4 and 5, the zone of final sewage mineralization extending to 500 m from the outlet, with development of the chrysophytes Hydrurus foetidus and Homoeothrix janthina, and presence of the diatoms Fragilaria capucina, Ceratoneis arcus, and Cymbella vertricosa. (4) Station 6, an oligotrophic segment about 2.7 km downstream, dominated by the chrysophytes Hydrurus foetidus and Homoeothrix janthina, and the diatoms Ceratoneis arcus, Diatoma hiemale, D. hiemale var. mesodon, Cocconeis placentula var. euglypta, Achnanthes minutissima, and A. microcephala. Of 153 taxonomic units identified, diatoms constituted 86.3%, chrysophytes 6.3%, cyanophytes 4.6%, rhodophytes 1.3%, and yellow-brown algae and fungi 0.6%. Quantitative changes in the annual cycle and ecological characteristics are described. (Lynch-Wisconsin)
W79-00220

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 4. THE BOTTOM FAUNA OF THE STREAM RYBI POTOK (THE HIGH TATRA MTS),
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
A. Kownacki.
Acta Hydrobiologica, Vol 19, No 3, p 293-312, 1977. 3 fig, 1 tab, 37 ref.

Descriptors: *Benthic fauna, *Rybi Potok(Poland), *Water pollution effects, *Bioindicators, *Sewage disposal, *Insects, *Eutrophication, Invertebrates, Streams, Mountains, Tatra Mountains, *Poland, Tourism, Biocenoses, Chironomidae, Faunal lists, Mayflies, Self-purification, Larvae, Succession.

Bottom fauna of the Rybi Potok, a mountain stream in Poland's Tatra National Park--polluted at its source by sewage from an intensively used tourist shelter--was sampled 1971-72 to study pollution effects. Characteristic zoocenoses permitted four zones to be distinguished: (1) A septic zone one meter from the sewage discharge, with larvae of the genus Psychoda (Diptera) dominant. (2) A zone of strong pollution 3-10 m below the outlet, dominated by Ostracoda, Oligochaeta, Ne-

ıtoda, and the chironomids Prodiamesa vacea, Paratanytarsus sp, and Chironomus gr. ımmi. (3) A zone of self-purification 30-500 m low the outlet characterized by vigorous in-ease in total fauna, and dominated by the ironomids Orthocladiinae juv., Thienemanniella , and Microcricotopus sp. (4) A pure montane eam zone sampled about 2.7 km below the out-, typical of other Tatra Mountain streams, minated by the mayfly Baetis alpinus and the ironomids Orthocladius rivicula and O. saxosus. e 113% gradient in Zone 4 influences the fauna significantly as the change in sewage concentra-n. The stream rises from Lake Morskie Oko at altitude of 1393 m, flows across a wide terrace, d then spreads to form the Rybie Stawki with a pth of about 3 m. Subsequently the stream be rrows, its gradient increasing rapidly, and the eam rushes down, breaking over huge boulders. ter four km, it enters the Bialka River at an al-ude of 1085 m. Fauna unique to the four zones e discussed in detail. (Lynch-Wisconsin)
79-00221

ONTINUOUS CULTURE OF MARINE ATOMS UNDER SILICON LIMITATION. 3. A ODEL OF SI-LIMITED DIATOM GROWTH,
ashington Univ., Seattle. Dept. of Oceanog-phy.
O. Davis, N. F. Breitner, and P. J. Harrison.
mnology and Oceanography, Vol 23, No 1, nuary 1978, p 41-52. 6 fig, 3 tab, 32 ref.

escriptors: *Diatoms, *Silicon, *Limiting fac-rs, *Model studies, *Plant growth, Skeletonema costatum, Algae, Cultures, Marine gae, Simulation analysis, Mathematical models, licic acid, Absorption, Michaelis-Menten equa-on, Silica, Frustules, Light intensity, haetoceros debilis, Thalassiosira gravida, ytoplankton, Chemostats.

model based on a recently-confirmed biochemi-l framework by Werner (1966) and on extensive periments with Skeletonema costatum, haetoceros debilis, and Thalassiosira gravida, as developed for simulating silicon-limited atom growth, in which silicic acid uptake is escribed by Michaelis-Menten kinetics. The odel was specifically designed to simulate eady-state and transient behavior of a silicon-nited diatom population growing in a chemostat. mulations compared with actual chemostat sults indicate the model realistically represents atom response. As diatoms require silicon to nthesize frustules, it can be assumed that silicon pply as orthosilicic acid can at times limit owth. Utilization of silicon within the cell is a nction of silicon available in small intracellular ools, while growth is a function of silica in the ustule. Uptake is frequently limited by the sil-on utilization rate within the cell, which may be t by enzymes, or more likely one key enzyme, hich regulate the process of frustule formation. ther factors, such as light or other nutrients, may so limit growth, and in turn may limit silicon ilization within the cell and silicic acid uptake. ll chemostat verification testing was done with S. ostatum grown at 18C under continuous light. he chemostat perturbation technique was the rincipal subject of the modeling experiments. ee also W73-14188) (Lynch-Wisconsin)
79-00229

RITERIA DOCUMENT FOR DDT.
nvironmental Protection Agency, Washington, C. Office of Water Planning and Standards.
or primary bibliographic entry see Field 5A.
79-00276

PECIES DIVERSITY INDICES OF THE FISH OPULATIONS OF STREAMS DRAINING ELECTED TEST AREAS ON EGLIN AIR ORCE BASE RESERVATION FLORIDA,
ir Force Armament Lab., Eglin AFB., FL.
or primary bibliographic entry see Field 7C.

W79-00277

MICROBIAL DEGRADATION OF DDT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
M. Alexander.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 575, Price codes: A03 in paper copy, A01 in microfiche. Department of the Navy, Office of Naval Research, Annual Report No 4, p 45 p, July 1976. 10 fig, 12 tab, 19 ref.

Descriptors: *Microbial degradation, *DDT, *Bacteria, *Fungi, *Pseudomonas, Biodegradation, Metabolism, Chlorinated hydrocarbon pesticides, Pesticides, Pesticide kinetics, Path of pollutants, Organic pesticides, Organic compounds, Gas chromatography, DDD, DDE, *DDM, *DDA, *DBP, *DBH.

The products formed in the metabolism of DDT by bacteria and fungi were identified as 1,1-dichloro-2, 2-bis(P-chlorophenyl)ethane, 1,1-dichloro-2,2-bis(P-chlorophenyl)ethylene, DDM, DBH, and DBP. Several other, as yet uncharacterized products were also synthesized by these microorganisms. The compounds identified during the degradation of DDT metabolites were: DDM, DBH, and DBP from DDA; DBH and DBP from DDM; and DBH from DBP. An important metabolite reported for the first time with fungi is P-chlorophenylacetic acid (PCPA), a ring cleavage product generated in the degradation of DDM. P-Chlorophenylglyoxaldehyde is also reported for the first time as a product of ring cleavage. (EIS-Deal)
W79-00278

CRITERIA DOCUMENT FOR TOXAPHENE.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00281

CRITERIA DOCUMENTS FOR ALDRIN/DIELDRIN.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00282

PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS - OPTICAL BRIGHTENERS, METHYL CHLOROFORM, TRI-CHLOROETHYLENE, TETRACHLOROETHYLENE AND ION EXCHANGE RESINS,
Franklin Inst. Research Labs., Philadelphia, PA. Science Information Services Dept.
For primary bibliographic entry see Field 5A.
W79-00283

A PERIPHYTIC MICROFLORA ANALYSIS OF THE COLORADO RIVER AND MAJOR TRIBUTARIES IN GRAND CANYON AND VICINITY,
Northern Arizona Univ. Flagstaff. Dept. of Biological Science.
For primary bibliographic entry see Field 5A.
W79-00285

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT,
Versar, Inc., Springfield, VA.
For primary bibliographic entry see Field 5B.
W79-00289

ASSESSMENT OF THE ENVIRONMENTAL IMPACTS ON THE BAN ON IMPORTS OF PCBS,
Versar, Inc., Springfield, VA.
For primary bibliographic entry see Field 5G.

W79-00290

BIOLOGICAL EFFECTS AND ENVIRONMENTAL ASPECTS OF 1,3-BUTADIENE,
Radian Corp., Austin, TX.
T. B. Parsons, and G. E. Wilkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 982, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/2-76-004, 52 p, May 1976. 4 tab, 108 ref.

Descriptors: *Human pathology, *Toxicity, *Chemical properties, *Synthetic rubber, Animal pathology, Organic compounds, Chemical analysis, Reproduction, Animal physiology, Respiration, Animal metabolism, Environmental effects, Path of pollutants, Industrial wastes, Chemical wastes, *Butadiene.

This report is a summary of the literature on the biological effects and environmental aspects of 1,3-butadiene. It was prepared from articles and abstracts identified through a search of the technical literature. The report contains information on the effects of 1,3-butadiene in environmental samples and on the reactivity of 1,3-butadiene in environmental media. (EIS-Deal)
W79-00292

STUDIES IN MICROBIAL CHEMOTACTIC BEHAVIOR IN SEAWATER,
Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
R. Mitchell, I. Chet, and P. Asketh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 834, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 7, 30 p, January 1976. 6 fig, 4 tab, 25 ref.

Descriptors: *Toxicity, *Marine microorganisms, *Pseudomonas, Water pollution effects, Aquatic bacteria, Amino acids, Biochemistry, Organic compounds, Oil, Oil pollution, Biodegradation, Metabolism, Cytological studies, Nutrients, *Chemotaxis.

This report describes our research into detrimental effects on marine microbial processes of sub-lethal concentrations of pollutants. In the first section of this report we outline a technique for isolation of specific marine chemotactic bacteria capable of both finding a chemical and utilizing it as a substrate. In the second section of the report we describe the results of our study of the relationship between chemical structures of attractants and chemotaxis of marine bacteria. The third phase of the research described in this report involved a study of the effects of sub-lethal concentrations of petroleum hydrocarbons on organic matter decomposition in seawater. We concluded from these studies that chemotaxis inhibition by sub-lethal levels of pollutants retards organic matter decomposition in seawater. (EIS-Deal)
W79-00293

ENVIRONMENTAL EFFECTS OF SCHUYLKILL OIL SPILL II, JUNE 1972.
Environmental Protection Agency, Washington, DC. Spills Prevention and Control Board.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 412, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-430/9-75-019, December 1975. 205 p, 52 fig, 8 tab, 6 app, 28 ref.

Descriptors: *Lead, *Oil, *Oil pollution, *Oil spills, Organic compounds, Path of pollutants, Aromatic compounds, Heavy metals, Public health, Potable water, Water analysis, Chemical analysis, Zinc, Benthic fauna, Sediments, Floods, Water pollution effects, Aquatic plants, Pennsylvania, *Aliphatic compounds, *Schuylkill River(Penn).

The fate and effects of a spill of six to eight million gallons of waste crankcase oil refined sludge into the Schuykill River, Pa., in June of 1972 have been studied. The spilled oil contained high concentrations of heavy metals and aliphatic and aromatic hydrocarbons. The spill occurred during a flood, and riverbank trees were coated with oil. Levels of lead were higher in downstream trees; however, no direct permanent effects were noted. Levels of heavy metals in river waters remained below those set by the U.S. Public Health Service for drinking water supplies; however, higher concentrations of lead and zinc were observed downstream. Levels of lead in sediments were higher downstream. Concentrations of petroleum hydrocarbons in sediments were higher downstream. Concentrations of petroleum hydrocarbons in sediment were higher at downstream stations. Concentrations of lead in downstream benthic macrofauna were higher. (EIS-Deal)
W79-00294

PCB IN WATER, A BIBLIOGRAPHY, VOLUME 3.
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5A.
W79-00305

ANNUAL SUBSURFACE TRANSPORT OF A RED TIDE DINOFLAGELLATE TO ITS BLOOM AREA: WATER CIRCULATION PATTERNS AND ORGANISM DISTRIBUTIONS IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, MD. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore, MD. Dept. of Biology.
M. A. Tyler, and H. H. Seliger.
Limnology and Oceanography, Vol. 23, No. 2, p 227-246, March 1978. 15 fig, 50 ref. ERDA EY-76-S-02-3278.

Descriptors: *Red tide, *Dinoflagellates, *Chesapeake Bay, Water circulation, Biological properties, Chlorophyll, Coasts, Tidal waters, Circulation, Water transfer, Depth, Bays, Estuaries, Biology, Marine biology, *Prorocentrum.

An annual, long-range, subsurface transport of Prorocentrum mariae-lebouriae, from the mouth of the Chesapeake Bay to its bloom area in the upper bay, a distance of 240 km, was described and documented completely. Prorocentrum in surface outflowing waters at the mouth of the bay is recruited in late winter into more dense inflowing coastal waters. Strong stratification produced by later winter-early spring surface runoff results in the development of a stable pycnocline. Prorocentrum, now in northward-flowing bottom waters, is retained in these bottom waters. It accumulates in a subsurface concentration maximum below the pycnocline and is transported northward to reach its bloom area in the Patapsco River and north of the Bay Bridge by late spring. The rapidly decreasing depth of the upper bay causes the pycnocline to rise, mixing the previously light-limited Prorocentrum and its nutrient-rich bottom waters to the surface, where rapid growth ensues. Once the dinoflagellate is in surface waters, positive photo-taxis, combined with both wind- and tide-driven surface convergences, produce dense surface patches or red tides. Prorocentrum is retained effectively in the bay until late winter by sequential inoculation into the tributary estuaries on the western shore, which exchange relatively slowly with bay waters. By late winter the annual cycle is complete. Prorocentrum is again in surface waters at the mouth of the bay where it is reintroduced into northward-flowing bottom waters. The mechanisms described provide a key to understanding the origins of subsurface chlorophyll maxima and the delivery of toxic dinoflagellates to coastal bloom areas. (Sims-ISWS)
W79-00317

THE BIOLOGICAL EFFECTS OF TOXIC MATERIAL SPILLS,
Environmental Protection Agency, Edison, NJ.
R. J. Nadeau.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9853-0178 ($0.75). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 7-10, 1978, 12 ref.

Descriptors: *Water pollution effect, *Toxicity, *Chemicals, *Ecosystems, Aquatic life, Fish kills, Water pollution, Environment, Phytotoxicity, Biological toxicity, Pollutants.

The environmental impact of toxic material spills depends on both the physical characteristics of the material and the environmental conditions at the time. This point is demonstrated by a discussion of certain general biological toxicity response mechanisms. For example, water soluble substances are likely to produce a stronger and more widespread effect than non-soluble substances. However, non-soluble materials can travel down a stream as an undiluted mass or slug, killing organisms in its path on contact. In other cases, a non-soluble material may be miscible forming a coating over the surface which asphyxiates or prevents proper feeding of some organisms. Toxic substances may act directly to kill life forms and juvenile stages are usually the most sensitive. Toxic substances may also act indirectly by destroying food sources or by reducing resistance to infection and stress. Recovery of damaged ecosystems is discussed with emphasis on the feasibility and desirability of intervening to aid or speed restoration. Careful analyses of genetic, physiological, and ecological factors are essential to deciding where, when, and how restoration attempts should be made. (See also W79-00342) (Majtenyi-IPA)
W79-00344

SAFETY ASPECTS OF TOXIC AND HAZARDOUS SPILLS,
Wood (William S.) and Associates, West Chester, PA.
For primary bibliographic entry see Field 5G.
W79-00345

EFFECT OF WHEY APPLICATION ON CHEMICAL PROPERTIES OF SOILS AND CROPS,
Kraft, Inc., Glenview, IL.
For primary bibliographic entry see Field 5E.
W79-00363

BIOLOGICALLY ACTIVE SUBSTANCES IN PULPING WASTE LIQUORS. I. SUBSTANCES ACTIVE AGAINST TERMITES, COPTOTERMES FORMOSANUS SHIRAKI, IN KRAFT PULPING AND BLEACHING WASTES,
Kochi Univ. (Japan).
For primary bibliographic entry see Field 5D.
W79-00404

BIOASSAY RESULTS OF KRAFT MILL EFFLUENT AT ARTIFICIALLY ELEVATED LEVELS OF BIOSOLIDS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
A. L. Caron, E. L. Owens, and W. Seim.
NCASI Stream Improvement Technical Bulletin, No. 307, 12 p, March, 1978. 2 fig, 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Fish, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Chinook salmon, Aquatic animals, Aquatic life, Salmon, *Bioassay, Suspended solids, Water pollution, Fishkill, Resin acids.

Total fish (Fall Chinook salmon) survival occurred in the 96-hr bioassay when a biologically treated unbleached kraft mill effluent was fortified with nonsettleable biosolids which reached a concentration of 9,800 ppm. Studies carried out for periods of 10 and 12 days showed no significant effects of biologically treated effluent containing up to 20 ppm suspended solids on growth rates. The total resin acid concentration in the bioassay solutions was about 36 mg/liter or 36 times that which produces a bioassay response in straight biologically treated kraft mill effluent. The resin acids associated with residual biosolids do not have the same effect on fish as those residing in the dissolved form. Any benefits assigned to resin acids reduction in effluents that are associated with a reduction in suspended biosolids by filtration are considered to be minimal or nonexistent. (Swichtenberg-IPC)
W79-00406

A STUDY OF THE FATE OF BIOSOLIDS FROM BIOLOGICALLY TREATED EFFLUENT IN LABORATORY AND CONSTRUCTED STREAMS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
D. L. Borton, H. Costa, and W. Green.
NCASI Stream Improvement Technical Bulletin, No. 308, 18 p, April, 1978. 4 fig, 6 ref, 1 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Aquatic life, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, Suspended solids, Aerated lagoons, Bacteria, Periphyton, Invertebrates, Food chains, Organic matter, Oxidation lagoons, Carbon radioisotopes, Radioisotopes, Aquatic animals.

Carbon-14 labeled suspended solids from a laboratory aerated stabilization basin fed bleached kraft mill effluent were introduced into laboratory streams, and their uptake into the periphyton and macroinvertebrate community was monitored. Over 95% of the biosolids measured as total suspended solids (TSS) in the full-scale and laboratory stabilization basins were of bacterial origin. Some biosolids were quickly ingested by a variety of invertebrates, including both grazing and filter feeding organisms. Some organic materials from the ingested biosolids were incorporated into invertebrate tissue, demonstrating one pathway of their incorporation into the aquatic food chain. The introduction of 1-2 mg/liter of TSS into the streams for over two years did not result in measurable differences in the amount of organic matter accumulated on the bottom. (Witt-IPC)
W79-00407

BIOLOGICAL EVALUATION OF ACUTE TOXICITY OF SELECTED FINISHING AGENTS (BIOLOGICZNA OCENA TOKSYCZNOSCI OSTREJ WYBRANYCH SRODKOW POMOCNICZYCH),
Medical Academy, Lodz (Poland).
B. Strzelecka, H. Hubner, T. Jankowska, and J. Rouba.
Przeglad Wlokienniczy, Vol. 32, No. 2, p 74-76, February, 1978. 7 ref, 2 tab.

Descriptors: *Textiles, *Water pollution effects, *Toxicity, Wastes, Industrial wastes, Anions, Cations, Aquatic life, Fishm, Crustaceans, Worms, Invertebrates, Aquatic animals, Effluents, Water pollution sources, Water pollution.

Eighteen commercial cationic, anionic, and nonionic agents used in textile finishing and processing were tested for their toxicity to aquatic organisms (the worm Lumbriculus variegatus, Daphnia magna, the crustacean Asellus aquaticus, and the fish Lebistes reticulatus). All agents are characterized by slow biodegradability and are currently discharged into waterways with industrial effluents. Depending on the test organism, the LC(50)/96-hr toxic levels ranged from 0.004 to 4238 g/liter, the toxicity of most agents being high. The cationic agents were highly toxic for the lower organisms, while fish were affected more by

nic agents. It is suggested that the least toxic
its should be used in finishing (e.g., Erional
S, Utinal 302, and softener IW) and an attempt
ld be made to reduce the concentration of
s agents in the effluents. (Stapinski-IPC)
-00413

VIVAL AND EARLY GROWTH OF
ECTED TREES ON WASTE WATER APPLI-
ION SITES,
h Central Forest Experiment Station, St.
, MN.
primary bibliographic entry see Field 5E.
-00422

NOTE ON EFFECTS OF SEWAGE EF-
ENT IRRIGATION ON SPECIFIC GRAVI-
AND GROWTH RATE OF WHITE AND RED
KS,
souri Univ.-Columbia. School of Forestry,
eries and Wildlife.
primary bibliographic entry see Field 5E.
-00425

UATIC INHABITANTS OF A MINE WASTE
EAM IN ARIZONA,
ona State Univ., Tempe. Dept. of Zoology.
Lewis.
artment of Agriculture, Forest Service,
earch Note RM-349, 7 p, November, 1977. 1
3 illus. 12 ref, 3 tab.

criptors: *Mine wastes, *Aquatic life, *Water
ution effects, *Arizona, *Copper, Water pollu-
sources, Heavy metals, Biota, Water quality,
er pollution, Wastes, Industrial wastes,
pended solids, Benthic flora, Benthic fauna,
v, Flow rates, Metals, Manganese, Zinc, Iron,
ium, Calcium, Magnesium, Fish, Bottom sedi-
ts, Geomorphology, Aquatic hibitats.

nges in biotic composition and water quality in
pper mine waste stream were monitored be-
and after a large discharge of waste altered
stream's geomorphology and water quality.
stream carries effluents from a mine tailings
d into Pinto Creek. Initial water quality and
ic composition in the waste stream resembled
e in a control stream; however, after the waste
ix, biotic diversity was reduced and water
ity was degraded. Suspended solids as high as
0 mg/liter (mean, 2,300 mg/liter) during the
urbance settled and quickly blanketed the
am bed and buried benthic vegetation and in-
ebrates. Flow at this time (20 liters/sec) and
equently (less than 8 liters/sec) was in-
quate to completely scour the deposits. As a
lt, biotic composition in the lower stream area
ar after the dam rupture was approximately
less than before the disturbance. Metal
dues (Cu, Mn, Zn, Fe, Mg, Ca, Na) in inver-
ates, aquatic vegetation, fish, and sediments
n the waste stream were significantly higher
those in similar species from unpolluted
ams. The effect of these residues on biotic sur-
l was not yet discernible. (Witt-IPC)
-00426

ROCHEMICAL INFLUENCES ON THE
HERY WITHIN THE PHOSPHATE MINING
EA OF EASTERN IDAHO,
rmountain Forest and Range Experiment Sta-
, Ogden, UT.
S. Platts, and S. B. Martin.
artment of Agriculture, Forest Service,
earch Note INT-246, 15 p, May, 1978. 1 fig, 19
6 tab.

criptors: *Fish, *Phosphates, *Mine wastes,
ter pollution effects, *Idaho, Water quality,
vy metals, Water pollution sources, Cutthroat
t, Trout, Aquatic animals, Aquatic life, Fresh-
er fish, Water pollution, *Blackfoot
er(Idaho), Surface mining.

Water analyses of selected streams in the upper Blackfoot River drainage area (in the Caribou National Forest, Diamond Creek Planning Unit, Idaho) showed these streams to be in a near-natural state, with possible modification from surrounding land uses. Physical conditions of fish in these streams were good. No influences from present phosphate mining were found that threatened fish health or survival. Hydrochemically, the Blackfoot system is capable of producing a good cutthroat trout fishery, but high levels of nutrients probably restrict optimum fish populations. (Witt-IPC)
W79-00427

THE EFFECT OF REDUCED WETLANDS AND STORAGE BASINS ON THE SIZE, STABILITY AND PRODUCTIVITY OF THE WATERSHED MIXING ZONE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2L.
W79-00441

MUSCULIUM TRANSVERSUM IN THE ILLINOIS RIVER AND AN ACUTE POTASSIUM BIOASSAY METHOD FOR THE SPECIES,
Western Illinois Univ., Macomb.
K. B. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 088, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 79 p, 12 fig, 21 tab, 37 ref, 2 append. OWRT B-097-ILL(3).

Descriptors: *Bioassay, *Potassium, Toxicity, Water quality, Water pollution effects, Rivers, *Pollutant identification, *Clams, Fingernail clam, *Illinois River.

The status of Musculium transversum in the Illinois River was investigated in the fall of 1975 by making 3 to 5 Ekman grabs at 20 stations in the Illinois River from mile 18.9 to 277. The findings indicate that M. transversum is restricted to the lower 107 miles of the river at densities of 25.8 to 43.1/m2. Compared with past data the population is greatly reduced, particularly in the middle Illinois River. Other organisms collected were categorized according to major taxonomic groups. An acute bioassay method, utilizing static and continuous-flow systems, was developed for M. transversum to enable investigation of the possible cause of the decline. Potassium was the first toxicant to be studied. The results indicated a lethal threshold of 200 mg/l potassium for adults and probable lethal thresholds of 250 and 290 mg/l potassium for juveniles. Adults responded 5 to 1.6 times faster to potassium in water with a hardness of 243 mg/l as CaCO3 than in water with a hardness of 314 mg/l as CaCO3. Juveniles responded significantly faster at a test temperature of 16.7C than at 6.5C. Potassium concentrations found in water collected near the surface of the Illinois River were not in the acutely lethal range for M. transversum in the laboratory. However, before potassium can be eliminated as a possible cause of decline, a study of the chronic effects of the potassium levels found in the Illinois River must be completed.
W79-00443

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTED WATERSHED,
Kentucky University, Lexington, Water Resources Research Institute.
For primary bibliographic entry see Field 5B.
W79-00448

A COMPARATIVE IN VITRO STUDY OF THE EFFECTS OF VARIOUS BALANCED SALINE SOLUTIONS ON RESPIRATION RATES OF LIVER TISSUES OF THREE FISH SPECIES,
Tennessee Technological Univ., Cookeville.
P. D. Cothron.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 139, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, June 1977. 54 p, 13 tab, 28 ref, append. OWRT A-034 TENN(1).

Descriptors: Balanced saline, Respiration, Fish, Respirometric media, Water pollution effects, *Fish tissue respiration, Pollutant identification, *Tissue bioassay, *Bioassay techniques.

A balanced saline solution for fish tissues was needed for use in a series of manometric experiments dealing with oxygen uptake by fish liver. Using literature values, several balanced saline solutions were postulated and were compared to Krebs-Ringer Phosphate. Results of this research indicated that differences in the basic fish and mammalian salines tested did not significantly affect cellular respiration in fish liver mince. In liver tissues which contained sufficient oxidizable substrate, presence or absence of glucose and differences in ionic constitutents of the fish and mammalian solutions tested had no effect on cellular respiration in liver tissue mince during a 45 minute period. In cells apparently lacking sufficient oxidizable substate, glucose-containing media produced results significantly different from those yielded by non-glucose-containing media. Effects of pH and of temperature were observed.
W79-00454

GENETIC AND ENVIRONMENTAL FACTORS INVOLVED IN INCREASED RESISTANCE OF BROOK TROUT TO SULFURIC ACID SOLUTIONS AND MINE ACID POLLUTED WATERS,
Pennsylvania State Univ., University Park. Dept. of Biology.
F. A. Swarts, J. E. Dunson, and J. E. Wright, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as P-288 219, Price codes: A05 in paper copy, A01 in microfiche. Research Project Technical Completion Report, Inst. for Research on Land and Water Resources, University Park, PA, September 1978. 94 p, 2 fig, 17 tab, 51 ref, 2 append. OWRT A-042-PA(5). 14-34-0001-6039.

Descriptors: *Brook trout, *Acidic water, *Hydrogen ion concentration, *Acid mine water, Juvenile trout, Equilibrium, Water pollution effects, *Wild brook trout, Hatchery fish, Embryonic, Adult brook trout, Sodium loss, Sex, Survival ability, Hereditary resistance, Low pH, Sulfuric acid solution.

Several strains of hatchery-reared brook trout were exposed to low pH in the laboratory and in the field. Wild brook trout were also used in some field tests. Tests were both acute and chronic. Pronounced strain differences in survival ability were detected among embryonic, juvenile, and adult brook trout in laboratory tests, and among juvenile brook trout in field tests. Fish had longer resistance times in sulfuric acid solutions and in mine acid polluted water if they were held previously in, respectively, pH 8 laboratory water, or non-acidic field environments. Wild brook trout survived longer at lethal field pH levels than hatchery fish which were tested immediately upon transport from the hatchery. Development of embryonic brook trout was delayed in sulfuric acid solutions of low pH. The time to loss of equilibrium at low pH was well correlated with total survival time. The rate of net sodium loss at low pH was inversely correlated with the resistance times of brook trout. Fish had shorter resistance times in mine acid waters than in laboratory sulfuric acid solutions of comparable pH. Larger and older fish tended to survive longer. The most important factors in enhancement of acid resistance in hatchery brook trout were the hereditary resistance of a

given strain and the acclimation of fish to non-acidic stream or laboratory conditions prior to acid exposure.
W79-00458

ARCADIA LAKE WATER-QUALITY EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
R. W. Hall, Jr., R. H. Plumb, K. W. Thornton, R. L. Eley, and A. S. Lessem.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 492, Price codes: A14 in paper copy, A01 in microfiche. 315 p 11 fig, 48 tab, 133 ref, 4 append. DOL 740015.

Descriptors: *Water quality, *Mathematical models, *Nutrients, *Water chemistry, *Water properties, Model studies, Eutrophication, Chemical analysis, Water quality standards, Coliform, Pollutants, Turbidity, Algae, Urban runoff, Pesticides, Agricultural runoff, Evaluation, Lakes, Stratification, *Arcadia Lake(Oklahoma), *Lake water chemistry, *Impoundment study, Nonpoint pollution sources.

The water quality of the proposed Arcadia Lake, Oklahoma, was evaluated relative to water quality criteria and standards appropriate for the project purposes. Study procedures included evaluation of existing data and previous studies of streams and lakes in the project area; collection and evaluation of additional field data; determination of available and limiting nutrients through algal bioassays; establishment of relationships between stream discharges and loadings of nutrients, metals, and pesticides based on stream concentrations and land-use patterns; application of various mathematical models; and comparison of predicted or measured results with existing or proposed water quality criteria. A comparison of average values for 70 water-quality parameters with the most stringent standard or criterion revealed that ammonia, manganese, mercury, DDT, dieldrin, aldrin, chlordane, lindane, heptachlor, PCB, phenols, and fecal coliforms equaled or exceeded permissible or recommended levels at least part of the time. Only coliform bacteria, ammonia, and manganese exceeded present Oklahoma standards applicable to proposed reservoir uses. Ammonia would not be expected to reach toxic concentrations in the hypolimnion of Arcadia Lake or to interfere with project purposes. Nutrient evaluations based on concentrations and loading indicated that the proposed impoundment would be eutrophic and that algal blooms were likely to occur during the late spring and summer months. Pesticides would not be expected to be a water quality problem in Arcadia Lake because sorption and precipitation would reduce concentrations significantly and restricted use of some of the pesticides has been implemented or is proposed by the EPA. Coliform bacterial contamination would be limited to the headwaters of the proposed impoundment during base flow. (Henley-ISWS)
W79-00463

NATURE AND IMPACT OF RURAL STREAM INPUTS ON WATER QUALITY,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
F. J. Humenik, M. R. Overcash, F. Koehler, L. Bliven, and J. W. Gilliam.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 676-681, July-August 1978. 2 fig, 4 tab, 6 ref. EPA R803328.

Descriptors: *Water quality, *Virginia, *Streams, *North Carolina, Rural areas, Streamflow, Streamflow forecasting, Water, Land use, Statistical methods, Statistics, Basins, *Rural water quality, *Stream inputs, *Chowan River Basin(NC), Soil-topographic-land use, Statistical survey, Stream reach studies, Statistical sampling.

Rural water quality was assessed by a statistical survey of small subbasins characteristic of rural areas in the Chowan River Basin, North Carolina. The portion of the Chowan Basin designated as study area was stratified on the basis of soil-topographic-land use factors, resulting in statistical coverage of about 25% of the 12,802 sq km (4,943 sq mi) basin. From the 4 designated strata, 15 subbasins were selected randomly to employ stratified random sampling as a monitoring strategy. Two of these subbasins were selected for intensive study of stream kinetic transformations with 6 sampling sites in a 5 km (3 mi) stream reach. After it was noted that water quality was similar in the study streams and the lower river, sampling was conducted to compare concentrations in these two areas. Also, a 32 km (20 mi) stream reach, which included a statistical survey site, was monitored to elucidate the relative magnitude of point and nonpoint impacts. Long-term data for the statistical sampling survey and results from the stream reach studies were presented and discussed. (Roberts-ISWS)
W79-00483

A COMPARISON BY SIZE CLASS AND VOLUME OF DETRITUS VERSUS PHYTOPLANKTON IN CHESAPEAKE BAY,
Chesapeake Biological Lab. Solomons, MD.; and Maryland Univ., College Park. Department of Botany.
For primary bibliographic entry see Field 2L.
W79-00494

5D. Waste Treatment Processes

CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.
For primary bibliographic entry see Field 5B.
W79-00005

WATER FILTERING AND DISPENSING APPARATUS,
For primary bibliographic entry see Field 5F.
W79-00019

METHOD OF DISPOSING OF WASTE WATER CONTAINING EMULSIFIED OIL,
Sumitomo Electric Industries Ltd., Osaka (Japan). (Assignee).
M. Noda, and K. Nomura.
U.S. Patent No 4,086,164, 10 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1431-1432, April 25, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Oil pollution, Separation techniques, Emulsions, Metal working industry, Combustion.

An economical process is provided for obtaining a stable, homogenous mixture which can be burned in combustion apparatus by introducing oil containing emulsified waste water produced in working metal with a water soluble lubricating oil or a water soluble cutting fluid. The oil containing emulsified waste water is concentrated to such a point that it becomes independently combustible. The surface active agent (or agents) which is present in the emulsified waste water is utilized to obtain a stable, homogeneous slurry by mixing the oily substance obtained by the concentration of the emulsified waste water with the inorganic substances obtained by filtering solid foreign bodies from the lubricating oil during metal working. The emulsified waste water is concentrated without breaking the emulsion by means of a physical-chemical apparatus which utilizes an ultra-filtration membrane or other device. (Sinha-OEIS)
W79-00020

TREATMENT OF SOLIDS-LIQUID-GAS MIXTURES,
Imperial Chemical Industries Ltd., London (England). (Assignee).
F. C. Roesler.
U.S. Patent No. 4,086,160, 7 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1430, April 25, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, *Water pollution treatment, *Activated sludge, Separation techniques, Aeration, Flotation, Sedimentation.

A solids-liquid mixture, such as waste water, containing biologically degradable material is treated in a circulatory system having an alternating upward and downward flow kept in motion by injection of gas such as air. A mixture is diverted from the system into a separating chamber in which solids-enriched mixture is separated by flotation and/or sedimentation. A solids-rich mixture, preferably recycled from the separation chamber, is fed into the system hydrostatically and thereby the concentration of such solids are transferred from one location to another without mechanical pumping. (Sinha-OEIS)
W79-00022

TREATMENT OF EFFLUENT,
C. R. Smith, and B. Mills.
U.S. Patent No. 4,085,688, 9 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1277, April 25, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Alkaline water, Hydrogen sulfide, Reduction(Chemical), Gases, Quenching, Scrubbers.

Contaminated aqueous alkali wash liquor from the treatment of gases containing hydrogen sulphide and/or hydrogen cyanide is reconstituted by treatment at an elevated temperature in a reducing atmosphere followed by quenching to form reconstituted wash liquor. The contaminated liquor is concentrated, before entering the reducing atmosphere, by direct contact with hot gases derived from the hot reducing atmosphere. Quenching and concentration are carried out by interaction of a gaseous medium with a liquid spray. Generation of the hot reducing atmosphere, reaction of the contaminated liquor with the hot reducing atmosphere, and concentration of the contaminated liquor may be carried out in a single chamber. (Sinha-OEIS)
W79-00024

TREATMENT OF LIME-SULFIDE TANNERY UNHAIRING WASTE,
Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).
M. Komanowsky, and H. I. Sinnamon.
U.S. Patent No 4,085,044, 3 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1058, April 18, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Tannery wastes, Separation techniques, Flocculation.

Improvements in the treatment of lime-sulfide unhairing wastes from both salt-cured and unsalted hides are provided. After undissolved lime is flocculated out of the waste of a salt-cured hide and the supernatant acidified to liberate hydrogen sulfide, the hydrogen sulfide is flashed off under reduced pressure at about from 100 degrees to 150 degrees F. The waste from unsalted hides is sparged with carbon dioxide prior to flocculation, the sparged waste is flocculated with a strongly cationic polyelectrolyte, and the hydrogen sulfide flashed off from the acidified supernatant liquid. (Sinha-OEIS)
W79-00026

RBON CONTACT COLUMN,
-Pro Systems, Inc., Lansdale, PA. (Assignee).
I. Ellis.
. Patent No 4,085,043, 7 p, 4 fig, 6 ref; Official
ette of the United States Patent Office, Vol
No 3, p 1057-1058, April 18, 1978.

criptors: *Patents, *Waste water treatment,
wage treatment, Water pollution treatment,
orption, *Activated carbon, Flow, Solids con-
processes, Equipment, Countercurrent flow.

ethod of and apparatus for handling granular
on which is used in an adsorption process
oving certain soluble organic compounds from
te water streams is described. It has been
d that flowing waste water through a carbon
mn in countercurrent contact with the flowing
on is a good technique for contaminate
oval. However in relatively small integrated,
abricated sewage treatment plants the height
he column is a critical limitation. Special
niques are required to cause carbon to flow in
lumn if the column does not have a hopper
om, agitator or vibrating mechanisms. One
on that special techniques must be used to in-
carbon flow is that as carbon is removed
the carbon bed, a cavity is produced which is
of anything but water and fines. Because of
cavity, a desired ration of carbon to water
ing out of the carbon outlet port cannot be ob-
ed. In this invention carbon is removed from
bottom of the column by a jet eductor. A
ce of fluidizing water is connected to the
mn adjacent to the eductor to prevent the for-
on of a cavity in the carbon bed in that area
cent to the jet eductor. (Sinha-OEIS)
-00028

**LOGICAL OXIDATION AND FLOTATION
ARATUS AND METHOD,**
C Corp., Chicago, IL. (Assignee).
. Fullerton, G. M. Kyrias, and R. B. Weber.
Patent No. 4,085,041, 25 p, 14 fig, 8 ref; Offi-
Gazette of the United States Patent Office,
969, No. 3, p 1057, April 18, 1978.

criptors: *Patents, *Sewage treatment, *Water
tion treatment, *Waste water treatment,
ogical treatment, Flotation, *Oxidation, Bub-
Biological treatment.

ogical oxidation and flotation apparatus and
od are disclosed for use in the treatment of
ge or other aqueous waste material by the ac-
ed sludge process. A treatment and flotation
nber is provided in which both biological ox-
on and flotation take place. The treatment and
tion chamber includes a quiescent zone at the
of the chamber that extends horizontally and
nward at least about three inches below the
ce of the contents of the chamber. The con-
of the chamber below the quiescent zone are
inuously recirculated. Oxygen-containing gas
les are introduced into the system to provide
en for biological treatment of the aqueous
rian and to provide bubbles which attach
selves to suspended solid particles to form a
in the quiescent zone at the top of the treat-
and flotation chamber. (Sinha-OEIS)
-00030

RIFICATION PROCESS,
gia-Pacific Corp., Portland, OR. (Assignee).
Neal.
Patent No. 4,089,799, 5 p, 7 ref; Official
tte of the United States Patent Office, Vol
No 3, p 1027, May 16, 1978.

riptors: *Patents, *Waste water treatment,
ustrial wastes, *Water pollution treatment,
ended solids, Separation techniques, Floccu-
, Magnetic properties, Ferromagnetic or-
composition.

A process is described for clarification of an aqueous liquid by Flocculating the finely divided particles in the liquid into a floc having magnetic properties and employing a magnetic field to enhance the settlement or separation of the magnetic flocs. The aqueous liquid is flocculated with a metal hydroxide, a water-soluble ferromagnetic lignosulfonate, ferromagnetic sulfonated tannin, or a ferromagnetic sulfonated phenol condensed with an aldehyde. The ferromagnetic composition is added in conjunction with an insoluble metal hydroxide flocculating agent or compound. The ferromagnetic organic compositions becomes associated or combined with the floc or flocculated particles to impart magnetic characteristics to the particles. The flocculated contaminants may then be removed from the liquid by using a magnetic filter or by settling in the presence of a magnetic field which will considerably increase the rate of settlement.
W79-00041

COLOR REMOVAL PROCESS,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
J. J. Svarz, F. N. Kemmer, and J. O. Fabri.
U.S. Patent No. 4,089,780, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1027, May 16, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Pulp and paper industry, Color, Separation techniques, Chemical precipitation.

Color is removed from paper mill waste waters by treatment with a cationic water soluble polyamine having an average molecular weight of at least 300 at a pH of 2 to 5, preferably 2.5 to 3.5, followed by precipitation with a water soluble anionic or nonionic organic polymer having an average molecular weight of at least 10,000. (Sinha-OEIS)
W79-00042

BATTERY OPERATED WATER PURIFICATION SYSTEM,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
For primary bibliographic entry see Field 5F.
W79-00043

METHOD FOR TREATING SEWAGE,
J. L. Ramer.
U.S. Patent No. 4,089,761, 4 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1022, May 16, 1978.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Biological treatment, Aerobic conditions, Oxygenation, Electrolysis, Anodes, Cathodes, Mixing, Equipment.

A method and apparatus for treating sewage is provided by first comminuting raw sewage to provide a slurry and then digesting the raw, comminuted sewage by oxygen-dependent bacteria in a roofed compartment. Oxygen is supplied by electrolysis of the water in the sewage, utilizing spaced anode and cathode. The anode is located in the roofed digestion compartment, and the oxygen generated at the anode is used by the bacteria; the cathod is located in a chimney which extends through the roof or top of the plant, to atmosphere, and the hydrogen generated at the cathod is discharged to the atmosphere through this chimney. A stirrer is provided in the digestion compartment to stir trapped oxygen back into the mass of sludge. A trapping or sedimentation comparment is provided after the digestion compartment, for settling out indigestible solids, and drawing off the remaining liquid. (Sinha-OEIS)
W79-00044

METHOD FOR CLARIFYING AQUEOUS WASTE LIQUIDS CONTAINING ACID DYES,
Nippon Carbide Kogyo Kabushiki Kaisha, Tokyo. (Assignee).
M. Nakajima, and K. Kuwabara.
U.S. Patent No. 4,088,573, 6 p, 2 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 635, May 9, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Dyes, Water purification, Separation techniques, Chemical precipitation, Flocculation, Resins, Filtration.

A method is provided for clarifying aqueous waste liquids containing acid dyes. The optimum amount of the dicyandiamide-formaldehyde resin and at least about 300 ppm, preferably at least about 350 ppm, of aluminum sulfate, both based on 100 ppm of the dye in the waste liquid, are added sequentially. There is no limitation in the order of adding them, but either can be added first. For example, the above resin is added to the waste liquid whose pH has been adjusted to a desired value, preferably an acidic region of not more than 7, in the course of conducting the waste liquid to a sedimentation apparatus or filtration apparatus, and the mixture is stirred so as not to cause nonuniformity in concentration. This results in the formation of a flocculated matter. Then, aluminum sulfate is added, and the mixture is stirred somewhat slowly. The flocculated dye can be sedimented or collected by filtration. Conversely, aluminum sulfate can be added first and then the resin. (Sinha-OEIS)
W79-00053

ACTIVATED SLUDGE SYSTEM WITH STAGGERED PARTITION BASIN,
Air Products and Chemicals, Inc., Allentown, PA. (Assignee).
C. S. Block, M. S. Chen, O. J. Noichl, and S. Hong.
U.S. Patent No. 4,087,361, 6 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 238, May 2, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, *Aeration, Settling basins, *Activated sludge, Mixing, Equipment.

A method and apparatus is provided for aerating mixed liquor in an activated sludge waste treatment system with aeration gas in which the geometry of the basin, and the mode of operation of te aerators aerating the mixed liquor, produce a series of liqid zones through which the mixed liquor flows in a generally serpentine manner from one noncompletely mixed liquor zone to the next such that the degree of effective liqid staging is greater than that achieved before. As a result, significantly more efficient purification of the influent wastewater stream can be achieved. (Sinha-OEIS)
W79-00055

PROCESS FOR REMOVING MERCURY AND MERCURY SALTS FROM LIQUID EFFLUENTS,
Montedison S.p.A., Milan (Italy). (Assignee).
G. Patron, D. Napoli, F. Nardone, G. Ratti, and G. Tubiello.
U.S. Patent No. 4,087,359, 4 p, 13 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Mercury, Separation techniques, Chemical reactions, Chemical precipitation, Coagulation.

A process is described in which mercury is removed from liquid effluents by precipitation with the use of only one reagent, regardless of the form in which the mercury is present. The mercury

is removed in such a form as to separable from the effluents by simple clari-flocculation. The mercury is effectively removed without prior remova of the suspended mud and inert products by filtering upstream from the purification plant. The process is accomplished by reacting the effluent, at a pH of from 9 to 14, with thiourea or with a hydroxylamine salt to precipitate the mercury and/or mercury derivatives and then separating the precipitate, together with muds and inert products, if any, by simple clari-flocculation. When thiourea is fed into waters containing mercury and/or mercury salts, it functions both as a precipitating agent and as a reducing agent and as a reducing agent for oxidizers, such as chlorine, which may be present. Hydroxaylamine serves as both a precipitating agent for forming highly insoluble amino-mercury salts and as a reducing agent which originates metallic mercury from mercury derivatives. (Sinha-OEIS)
W79-00056

WATER REUSE AT HIGHWAY REST AREAS: EVALUATION PHASE,
Virginia Highway and Transportation Research Council, Charlottesville.
C. E. Parker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 542, Price codes: A05 in paper copy, A01 in microfiche. Report VHTRC 78-R22, December 1977. 89 p, 24 fig, 21 tab, 7 ref, 4 append. HPR 1397 (C).

Descriptors: *Water reuse, *Water conservation, *Waste water treatment, *Rest areas, Filtration, Closed loop system, Granular filter, Biological oxidation, Biological treatment, Nitrification, Nitrates, Nitrites, Ammonia, Sewage, Sewage effluent, Aeration, Waste treatment, Water treatment, Highways, Chemical reactions, Recycling.

A system for recycling water used to flush water closets at a highway rest area on I-81 at Fairfield, Virginia, is evaluated. The method produces water of acceptable standards with no objectional odor or color, no foaming or apparent suspended solids, and having low bacterial count. Preliminary bench-scale research indicated that extended aeration biological treatment followed by granular media filtration would be acceptable. This led to installation of a full-scale field system at an existing rest area. A closed loop system was set up to and from water closets, with water balance achieved by wasting an amount of recycled water equal to the water input from sewered potable water. Equilibrium was achieved and recycling was estimated at 95%. Operation of the closed loop extended aeration and granular filter system was similar to conventional operation of these processes. The influence of nitrogen accounted for the most significant operating difference. Ammonia nitrogen transformation to nitrite and nitrate nitrogen resulted in an operating pH of 5.5 to 6.0 and, as a result, incomplete nitrification occurred. Although nitrogen buildup in the form of ammonia, nitrite and nitrate did occur, the concentrations did not cause a reduction in organic biological oxidation efficiency. Quality of the water varied between winter and summer operation, but remained acceptable as a flush fluid. (Majtenyi-IPA)
W79-00087

TRANSPIRATION AND EVAPORATION OF SEWAGE EFFLUENT,
Auburn Univ., AL. Engineering Experiment Station.
S. R. Jenkins, and F. J. Molz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 389, Price codes: A05 in paper copy, A01 in microfiche. Report HPR No. 81, December 1976. 75 p, 20 fig, 61 ref, 4 append. 930-074.

Descriptors: *Sewage treatment, *Sewage disposal, *Sewage effluents, *Spray irrigation, *Liquid wastes, *Evapotranspiration, Environmental sanitation, Evaporation, Transpiration, Highways, Waste water treatment, Waste water disposal, Irrigation, Spraying.

Experimental efforts to develop better methods of treating liquid wastes from roadside comfort stations are described. Existing methods of treating such wastes are often costly to operate and maintain and may not meet new State and Federal restrictions on waste discharges from lagoons and septic tanks. These experiments were aimed at developing practical, zero-discharge procedures for utilizing the evapotranspiration phenomenon to dispose of sewage effluent. In one experiment, impervious evapotranspiration units were constructed in rectangular excavations. Both raw domestic waste and settled domestic waste were pumped into or sprayed onto the units and the evapotranspiration rate was determined through a water balance. In a second experiment, effluent from a two-stage lagoon was sprayed on an area planted with grass and shrubs. Tests indicate that a 20,000 gallon per day comfort station would require a spray area of about five acres. It is concluded that such disposal systems are practical for many areas of the state, and that a well-designed, lagoon-fed spray irrigation system will be an economical, ecologically-sound method for disposing of liquid wastes from roadside rest areas. Such systems require little maintenance and blend in with the landscaping normally found at such comfort stations. (Majtenyi-IPA)
W79-00088

ENERGY CONSUMPTION OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., OR.
D. J. Hernandez.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 270, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-001, Jan 1978, 20 p, 1 fig, 6 tab, 10 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Energy consumption, *Ely, MN, Sludge pumping, Vacuum filtering, Sewage, Sewage treatment, Waste water, Municipal wastes, Sludge treatment, Primary productivity, Waste treatment, Water treatment.

Energy use at the advanced waste water treatment plant in Ely, MN, is analyzed and discussed under three categories; plant operation, support services, and indirect use. Some historical background is provided along with a description of the plant facilities. Direct energy utilization is defined as that actually involved in operating pumps, motors, chemical feed equipment, lighting, and heating. Energy used during primary, secondary, and tertiary plant treatments is noted. In addition, other energy consuming operations, such as sludge pumping and vacuum filtering are outlined in detail. Calculations for estimating energy consumption are supplied for direct energy useage only; however, indirect energy requirements that include energy consumed in making or processing materials used at the Ely plant, are probably greater. (Majtenyi-IPA)
W79-00102

ADSORPTION OF SOME TOXIC SUBSTANCES BY WASTE COMPONENTS,
Waste Research Unit, Oxon (England). Harwell Lab.
For primary bibliographic entry see Field 5B.
W79-00152

DEGRADATION OF AQUEOUS PHENOL SOLUTION BY GAMMA IRRADIATION,
Hiroshima Univ., (Japan). Inst. of Environmental Chemistry.
K. Sato, K. Takimoto, and S. Tsuda.
Environmental Science and Technology, Vol. 12, No. 9, p 1043-1046, September, 1978. 6 fig, 2 tab, 11 ref.

Descriptors: *Phenols, *Gamma rays, *Irradiation, *Chemical degradation, *Chemical wastes, Aqueous solutions, *Oxygenation, Chromatography, Infrared radiation, Mass spectrometry, Analytical techniques, Carbon dioxide, Waste water treatment, Industrial wastes.

The degradation products of an oxygenated phenol solution, gamma-irradiated with 53,000 rad/hr, were identified by high-speed liquid chromatography. Phenol degradation by irradiation followed the first order, yielding p-benzoquinone, hydroquinone, and catechol. Ether extraction of the first peak, representing a mixture of polar compounds, yielded eight additional peaks; these were identified by ultraviolet spectrophotometry as o,o'-biphenol, catechol, maleic acid, hydroquinone, and 1,2,4-trihydroxybenzene. Two unidentified peaks were further analyzed by infrared and mass spectrometry. One peak resembled either a muconic acid, aliphatic acid, or aldehyde; the other red-brown hydrazone was thought to have two carbonyl groups and at least two hydroxyl groups. Phenol consumption from 10, 50, 100, and 1000 ppm solutions indicated that the potential for recombination of irradiation-supplied radicals was greater at lower phenol concentrations. The number of phenol molecules destroyed per unit dose decreased with the residual phenol level in solutions bearing more than 50 ppm phenol; the degradation percentage increased as the phenol concentration decreased. Total organic carbon degradation decreased with increasing irradiation dosage. About 95% phenol consumption was required before total organic carbon was reduced; a radiation dose five times that needed to consume 95% of the phenol was required to convert phenol to carbon dioxide. At 60-70% phenol consumption, a secondary degradation of the primary products, catechol and hydroquinone, occurred. (Lisk-FIRL)
W79-00153

CONTROLS DRIVE PLATERS TO MATERIALS RECOVERY,
J. J. Obrzut.
Iron Age, Vol. 221, No. 33, p 35-36, 38-39, August, 1978. 2 fig, 4 tab.

Descriptors: Metals, *Chromium, *Nickel, *Reverse osmosis, *Electrodialysis, Ion exchange, Chemical, Phosphorus compounds, Chemical precipitation, Activated carbon, Ozone, Evaporators, Cadmium, Copper, Lead, Zinc, Mercury, Waste water treatment, Industrial wastes.

Processes to recover metals from electroplating effluents have been devised for compliance with stricter waste water discharge and toxic substances controls. Tubular, spiral-wound, and hollow-fine-fiber reverse osmosis units have been tested by the EPA for the recovery and recycling of process chemicals. The reverse osmosis permeate is returned to the rinsing tanks and metal concentrates are returned to the plating baths. Electrodialysis, especially following reverse osmosis, has been tested for treating concentrated effluents. Electrodialysis in conjunction with ion flotation has been effective in concentrating fluoborate reagents; the success of this treatment process may encourage the replacement of cyanide with fluoborate. Electrodialysis may also be applicable to recovery of hexavalent chromium and nickel from plating effluents. Evaporators for chromic acid recovery have reduced the acid requirements at one plant by 80%; evaporators are also being used to treat phosphate cleaning solutions. At ion exchange system also recovers phosphoric acid used in the bright finishing of aluminum; the reciprocating flow ion exchange system removes nickel salts from rinses. Iron sulfide precipitation is recommended for mixed metal effluents; activated carbon and ozone treatment of

ting wastes are also considered feasible. (Lisk-RL)
9-00154

MOVAL OF COMPLEX COPPER-AMMONIA NS FROM AQUEOUS WASTES WITH FLY H,
nnessee Valley Authority, Chattanooga. Div. of vironmental Planning.
. Chu, G. R. Steiner, and C. L. McEntyre.
rnal Water Pollution Control Federation, Vol. No. 9, p 2157-2174, September, 1978. 17 fig, 5 , 29 ref.

scriptors: *Copper, *Ammonia, *Fly ash, emical precipitation, *Waste dilution, Adsorp-, Alkalinity, Ammonium compounds, Bond- Chemical properties, Metals, Waste water tment, Industrial wastes.

e use of alkaline fly ash sluice water to dilute moniated-bromate metal cleaning wastes can uce residual copper levels to within 1.0 /liter, as mandated by EPA guidelines. Fly ash ce water pH, initial copper concentration, am-nia-to-copper mole ratio in the waste water, per precipitation by alkalinity, copper adsorp- on fly ash, and retention time are investigated factors influencing the efficiency of copper and monia removal. Theoretical copper residual ves after ash waste treatment are developed for ious ratios of copper, ranging 0.001-0.01 mole, mmonia, ranging 0.05-0.4 mole at pH>6. At pH an initial copper concentration of 100 mg/liter l an ammonia-to-copper mole ratio of 40 in a ste stream should not require dilution to duce a residual of 1.0 mg copper/liter; dilution equired for higher copper concentrations. The acity of fly ash to adsorb copper increases with reasing pH (11 to 11.9) and fly ash concentra-; copper precipitation decreases from 98.28 to 34% as pH increases from 11 to 11.9. The op-um parameters for removing copper and am-nia from metal cleaning waste streams include: tion in an ash pond with a pH greater than 8.5; y ash concentration of 1.7% in the raw fly ash ce water; and a retention time of 4-10 hrs. sk-FIRL)
9-00155

E ENVIRONMENTAL EFFECTS OF ROMIUM IN TANNERY EFFLUENTS,
rie Tanning Ltd. (Ontario).
primary bibliographic entry see Field 5C.
9-00156

COVERY OF TIN FROM ELECTROPLAT- SOLUTIONS AND RINSE WATERS,
llongong Univ. (Australia). Dept. of Chemistry.
llis, and R. W. Whitton.
luent and Water Treatment Journal, Vol. 18, 8, p 389-391, August, 1978. 3 fig, 3 tab, 9 ref.

scriptors: *Tin, *Solubility, *Alkalis(Bases), dium compounds, *Chemical precipitation, gnesium, Calcium, Iron compounds, Colloids, tals, Waste water treatment, Industrial wastes.

oratory tests investigated the parameters in-ncing the solubility of hydrous tin oxides O), precipitated from spent electrotinning ef-nt, in aqueous alkaline solutions. A typical nt electroplating stream, bearing 1.3 g/liter of II), 0.5 g/liter of tin(IV), and 2.1 g/liter of ride, was treated with solid Na2CO3 to cipitate HTO; the resulting concentrated slurry tested for solubility in alkalis by mixing a 100 aliquot with 100 ml of a NaOH solution. After ting and filtration, 10 ml aliquots of the suspen- and filtrate were mixed with concentrated SO4, HCl, and distilled water; the tin was uced to tin(II) by boiling and each solution was ted with a KIO3 solution. Alkaline solubility expressed as a function of the titrametric end-nts of both solutions; HTO was examined with a scanning electron microscope, X-ray fluorescence, and an electron microprobe. The precipitated HTO contained small amounts of Na, K, Fe, Si, Mg, Ca, Al, and other heavy metals. The adsorption of Ca and Mg ions onto HTO(IV) enhanced solubility; the presence of colloidal iron compounds improved solubility slightly. The HTO(IV) solubility in alkali was severely reduced at temperatures above 50C; tin(II) was relatively unaffected by temperature, although solubility decreased at higher Mg and Ca concentrations. The alkali solubility of HTO was slightly enhanced by the addition of a nonionic polyacrylamide. The ratio of tin(II) to tin(IV) in the electroplating effluent had a strong influence on alkali solubility. (Lisk-FIRL)
W79-00157

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART 2,
American Cyanamid Co., Stamford, CT.
For primary bibliographic entry see Field 5G.
W79-00158

THE EFFECT OF CYCLOHEXANE DERIVATIVES ON SELECTION OF BACTERIAL GROUPS FORMING ACTIVATED SLUDGE MICROFLORA,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
A. Bisz-Konarzewska.
Acta Microbiologica Polonica, Vol. 27, No. 2, p 155-160, 1978. 4 fig, 1 tab, 12 ref.

Descriptors: *Activated sludge, *Oil wastes, *Oil industry, *Pseudomonas, *Inhibition, Enteric bacteria, Cultures, Microorganisms, Incubation, Microbial degradation, Dominant organisms, Waste water treatment, Industrial wastes.

The presence of cyclohexane derivatives in oil waste favored the growth of Pseudomonas bacteria during activated sludge treatment. Both gram-negative and positive bacteria representing three Pseudomonas groups, contained in activated sludge with Enterobacteriaceae, Vibrio-Aeromonas, Achromobacter-Alcaligenes, and Flavobacterium, were exposed to 30, 100, and 200 mg/liter of cyclohexanol, cyclohexanon, or cyclohexylamine in a basal medium. Pseudomonas comprised more than 50% of the gram-negative bacteria which accounted for 90-97% of the total population. After 7 days of growth in the unspiked basal medium, Pseudomonas predominated, gram-positive bacteria diminished, and Flavobacterium was completely eliminated. Other gram-negative bacteria were hindered by the presence of cyclohexane derivatives after 7 days of incubation. Pseudomonas comprised 75-91% of the population grown in the presence of cyclohexanol, 93-97% in the cyclohexanon medium, and 76-99% in the cyclohexylamine culture. After 7 days in the control medium, Enterobacteriaceae, Vibrio-Aeromonas, and Achromobacter-Alcaligenes comprised 23-36% of the total population; their proportions were similar in the presence of cyclohexanol. Cyclohexanon and cyclohexylamine media greatly reduced or completely eliminated these gram-negative bacteria. (Lisk-FIRL)
W79-00159

CONTROLLING AND MONITORING ACTIVATED-SLUDGE UNITS,
Polybac Corp., New York.
G. T. Thibault, and K. D. Tracy.
Chemical Engineering, Vol. 85, No. 20, p 155-160, September, 1978. 11 fig, 13 ref.

Descriptors: *Activated sludge, *Oil wastes, *Oil industry, *Organic loading, *Toxicity, Oxygen demand, Dissolved oxygen, Growth rates, Biological treatment, Microbial degradation, Waste assimilative capacity, Waste water treatment, Sulfides, Industrial wastes.

Process monitoring and control techniques for refinery waste activated sludge units can prevent system upsets caused by organic and toxic shock loads. Cyanide shocks can cause a rapid decrease in the microbialgrowth rate and dissolved oxygen uptake rate (DOUR); sulfides also inhibit the growth rate but increase the DOUR. Maintaining a constant solids residence time (SRT) is equivalent to maintaining a constant microbial growth rate. The resistance of refinery activated sludge to shock loads increases as the SRT increases from 5 to 25 days. Clarifiers are usually designed to operate at a solids flux of 15-25 lbs/sq ft/day; solids flux is defined as the product of the influent flow rate, recycle rate, and total aeration basin suspended solids per unit surface area of the clarifier. Frequent monitoring of the DOUR and the total oxygen demand (TOD) or total organic carbon (TOC) in the feed stream can signal on-line changes in the growth rate. By monitoring the DOUR:TOD or TOC ratio, organic toxic loading can be detected; for toxic shocks caused by chemically oxidyzable sulfide, TOC must be monitored. Sludge wasting should cease at the onset of both toxic and organic shocks; additions of powdered activated carbon may protect microbial viability during toxic shocks. Dissolved oxygen should be maintained above 0.5 mg/liter during organic shocks. Shock loads can be effectively controlled by diverting toxic streams to holding basins and organic streams to the aeration basin exit to reduce solids flux.
W79-00160

REMOVAL OF AMMONIUM SULFIDE FROM WASTEWATER BY LIQUID MEMBRANE PROCESS,
Exxon Research and Engineering Co., Linden, NJ.
R. P. Cahn, N. N. Li, and R. M. Minday.
Environmental Science and Technology, Vol. 12, No. 9, p 1051-1056, September, 1978. 6 fig, 3 tab, 9 ref.

Descriptors: *Ammonium compounds, *Hydrogen sulfide, *Oily water, *Emulsions, *Permeability, Liquids, Steam, Permselective membranes, Separation techniques, Oil wastes, Oil industry, Waste water treatment, Industrial wastes.

Extripping, a liquid membrane process, has been developed to simultaneously extract ammonia from aqueous solutions and air- or steam-strip hydrogen sulfide from refinery sour water streams. Extripping utilizes a water-in-oil emulsion as the liquid membrane and a dissociated acid, such as sulfuric acid; under agitation, the oil emulsion forms droplets which surround the aid. Operated at 80 C, the extripping tower receives a stream of air, steam, or flue gas through its base as the ammonium sulfate effluent stream is introduced through the top of the column. Ammonia molecules permeate across the liquid membrane where they are neutralized and ionized by the acid; ammonia diffusion across the membrane into the emulsion droplets will continue as long as the undissociated ammonia concentration in the external phase is higher than the internal emulsion droplet concentration. The pH drops as ammonia permeation increases and the external concentration decreases, contributing to an increase in undissociated H2S and enhanced stripping. H2S-laden gas is passed through a condenser for reflux of all residual ammonia and then to a Claus plant for sulfur recovery. When a regenerable acid is used, ammonia is separated from the emulsion by heating; a sulfuric acid-bearing emulsion is broken to recover an ammonium sulfate solution suitable as a fertilizer. Extripping can achieve 95% or more removal in 10 min and 99% or more removal in 20 min.
W79-00161

NEKOOSA CLEANS CONDENSATES WITH STEAM DISTILLATION,
Mo Do Mekan, London(Ontario).
T. Burgess, and D. Voight.
Pulp and Paper Canada, Vol. 79, No. 8, p 72-74, August, 1978. 1 fig, 3 tab.

Descriptors: *Distillation, *Steam, *Condensation, *Pulp wastes, Pulp and paper industry, Sulfur compounds, Gases, Incineration, Heating, Organic compounds, Separation techniques, Waste water treatment, Industrial wastes.

A distillation column at Nekoosa Papers Inc.'s kraft mill in Wisconsin steam strips methanol, turpentine, and total reduced sulfur compounds (TRS) from digester blow gas, and foul condensates from turpentine recovery, and black liquor evaporation. The total condensate volume was reduced by separating the condensates from the multiple effect evaporators and by replacing the direct contact pre-coolers and intercondensers in the evaporators with indirect types. These modifications reduced the condensate to a flow of 336 gal/min, bearing 500 ppm TRS, 540 ppm turpentine, and 1800 ppm methanol. About 29,000 lbs steam/hr were needed in the distillation column to remove 90% of the methanol and all of the TRS and turpentine; by placing the 8-ft diameter, 60-ft high column between the first and second effects of the multiple evaporators, steam was supplied to the stripping column at lower costs. The condensate passes through a fiber strainer to remove particles prior to heating to 220 F in a heat exchanger. The condensate enters the top of the stainless steal distillation column and is stripped of contaminants as it passes down through the trays. The stripped pollutants and foul gases comprise the primary fuel in a fume incinerator which converts the products to water vapor, carbon dioxide, and sulfur dioxide at nearly 100% efficiency. Clean condensate passes through the heat exchanger to heat incoming condensate and is returned to the brown stock area for hot water tank makeup. Steam distillation reduces BOD by 85%, methanol by 89%, and sulfide by 99% after black liquor oxidation.
W79-00162

COLLECTING BARK BURNER ASH WITH ELECTROSTATIC PRECIPITATORS,
Research-Cottrell, Inc., Bound Brook, NJ.
R. L. Bump.
Paper Trade Journal, Vol. 162, No. 18, p 56-57, September, 1978. 1 fig.

Descriptors: *Pulp and paper industry, *Electrodes, *Dusts, *Bark, *Wood wastes, Air pollution, Resistivity, Electrical resistance, Boilers, Separation techniques, Ionization, Pollution abatement, Industrial wastes.

Electrostatic precipitators have been installed in two pulp and paper mills to remove fly ash from bark-fired boilers. In an electrostatic precipitator, entrained dust particles are ionized as the effluent stream passes between grounded collection plates, parallel to high-voltage electrodes, and collected on the electrodes. A removal efficiency of greater than 99% is possible with coal ash. Comparison of bark ash resistivities at temperatures of 250-650 F with resistivities occurring in municipal incinerators suggested that electrostatic precipitators could efficiently function with bark ash. A hog-fuel-fired pilot plant confirmed that bark ash fell within the resistivity range of the precipitator. Because of the light, flaky, and highly carbonaceous nature of the bark ash and large char particles within the gas stream, the electrostatic precipitator installed in the P.H. Glatfelter Co. plant in Spring Grove, Pennsylvania, incorporated a cyclone collector to remove large chars prior to the precipitator and a small length-to-height ratio; the velocity was also reduced to prevent re-entrainment of particles by flowing gas. The Georgia Kraft Co.'s boiler streams exhibited a bark ash resistivity of 8.74 billion ohms/cm and a coal ash resistivity of 85 billion ohms/cm; the bark ash was found to have a modulating effect on more resistant materials. A comparative survey indicated that precipitators had moderate installation costs and lower operating costs than fabric filters and scrubbers.
W79-00163

THE RADIATION-INDUCED DEGRADATION OF LIGNIN IN AQUEOUS SOLUTIONS,
Oji Paper Co. Ltd., (Tokyo) Japan.
T. Nagai, and N. Suzuki.
International Journal of Applied Radiation and Isotopes, Vol. 29, No. 4/5, p 255-259, 1978. 9 fig, 11 ref.

Descriptors: *Gamma rays, *Irradiation, *Optical properties, *Lignins, *Pulp wastes, Color, Organic compounds, Absorption, Oxygen, Nitrogen, Carbon dioxide, Chemical degradation, Oxidation, Pulp and paper industry, Waste water treatment, Industrial wastes.

Gamma irradiation in the presence of oxygen and nitrogen monoxide degraded sodium ligno sulfonate in aqueous solutions comparable to pulping waste water. A 200 ml aliquot of an aqueous solution bearing 100 ppm sodium ligno sulfonate was irradiated at room temperature with cobalt-60 gamma rays at dosages of 190,000 and 1,100,000 rad/hr; oxygen was bubbled through the liquid and, in some experiments, nitrogen or N2O was introduced. Absorption bands at 202.5 and 280 nm decreased with increasing irradiation dose and nearly disappeared at 5,500,000 rad for oxygen-saturated solutions; the reduction in optical density at 202.5 nm was greater for the N2O-saturated solution than for the oxygen- or nitrogen-saturated solutions. At 400 nm, the optical density in oxygen-saturated solutions increased with doses up to 1,100,000 rad and decreased with further irradiation; color nearly disappeared at 16,500,000 rad. The presence of normal-alcohols in nitrogen-saturated solutions significantly enhanced removal of color from 2,000 ppm lignin solutions at 1,100,000 rad. Addition of 60 millimoles of propyl alcohol increased color removal to 67%, compared to 33% for non-alcoholic solutions. Oxygen-saturated solutions exhibited the greatest reduction in total organic carbon and generated the largest quantity of carbon dioxide. The pH of oxygenated solutions decreased sharply with doses up to 1,100,000 rad, but gradually increased above 2,000,000 rad; this phenomenon was attributed to the oxidation of organic acids. (Lisk-FIRL)
W79-00164

WASTE WATER TREATMENT AND RE-USE WITHIN THE TEXTILE INDUSTRY,
M. T. Turner.
Water Services, Vol. 82, No. 990, p 527-528, August, 1978. 2 fig, 5 tab.

Descriptors: *Textiles, *Color, *Flocculation, *Coagulation, *Flotation, Dyes, Chemical oxygen demand, Water reuse, Lime, Polyelectrolytes, Settling basins, Turbidity, Waste water treatment, Industry.

Aluminum sulfate flocculation and dissolved air flotation were selected by a textile mill in North Lancashire, England, for recycling processing effluents. The colored effluent, flowing at a rate of 79.5 cu m/hr, contained about 2,566 mg COD/liter; reductions to 250 mg COD/liter were necessary for reuse. Aluminum sulfate was selected as a flocculant over ferric and ferrous sulfate because of its lower dosage requirements. Effluent is held in a flow balancing tank/sump for 45 min before it is transported by a submerged centrifugal pump to the flocculation tank. About 250 mg/liter of a 7.5% aluminum sulfate solution and 150 mg/liter of a lime slurry are added to the effluent which is retained in the tank for 15 min. About 1 mg/liter of polyelectrolyte is added to the flocculated effluent as it flows by gravity to the dissolved air flotation cell. The flotation cell has a central diffusion drum, a bottom subnatant collection system, and an ejector to dissolve the air into the effluent stream. A flight scraper removes floating material which is discarded; subnatant passes through a turbidimeter prior to lagooning for reuse. Costs for recycling the treated effluent are about 25% of those for discharging raw sewage. (Lisk-FIRL)
W79-00165

TEXTILE WASTE WATERS: TREATMENT AND ENVIRONMENTAL EFFECTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 3E.
W79-00166

HYDROLYSIS OF IRON FROM ACIDIC LIQUORS,
Arizona Univ., Tuscon. Dept. of Chemical Engineering.
A. D. Randolph, and R. D. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 523, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/2-78-143, July 1978. 46 p, 9 fig, 6 tab, 10 ref, 3 append. R-802390.

Descriptors: *Water pollution treatment, *Waste water treatment, *Acid streams, *Iron oxides, *Crystallization, *Ferric oxide, *Iron removal, *Hydrolysis, *Chemical precipitation, Water purification, Sulfuric acid, Copper, Iron compounds, Copper leach solutions, Industrial wastes.

A bench-scale procedure which uses a retained solids crystallization process to increase the iron removal rate from acidic process liquors is described. This increased removal rate with retained solids results in lower solution concentrations of iron. The solid product formed is called alpha hematite (Fe203) and is suitable for iron smelting. At the same time, sulfuric acid is regenerated for recycling to the leaching process. This process provides high yield iron removal under less severe conditions than those required for present continuous crystallization technology. A 2-gallon continuous pressurized reactor was built, capable of processing free acid and ferric iron concentrations up to 20 and 30 g/l, respectively, at temperatures of 135C to 165C. Ferrous iron was oxidized to ferric by overpressure of oxygen and oxidation rates were enhanced by oxygen sparging. The iron oxide was contaminated with a small amount of sulfate ion, but was practically free of other metal ions. (Majtenyi-IPA)
W79-00228

ECONOMIC ANALYSIS OF SELECTED FEATURES OF MUNICIPAL WASTEWATER CONSTRUCTION GRANT LEGISLATION,
Environmental Research Center, Research Triange Park, NC.
For primary bibliographic entry see Field 5G.
W79-00246

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED TREATMENT FACILITIES, 1974 'NEEDS' SURVEY, FINAL REPORT TO THE CONGRESS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-00248

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 921, Price codes: A10 in paper copy, A01 in microfiche. Water Resources Scientific Information Center Report OWRT/WRSIC 78-204, July 1978. 89 p, append.

Descriptors: *Ozone, *Bibliographies, *Water treatment, *Waste water treatment, Disinfection, Oxidation, Sewage treatment, Ozonation.

This report, containing 239 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES

TRACTS (SWRA). Volume 1 (see W78-1) covers the information announced in RA from October 1968 to December 1973. ume 2 covers the period from January 1974 to 1978. Author and subject indexes are in-ed.
-00306

TER -- 1977.
rican Inst. of Chemical Engineers, New York.
hE Symposium Series, Vol. 74, No. 178, d by G. F. Bennett, 1978, 321 p.

criptors: *Waste water treatment, *Water pol-n, *Industrial wastes, *Activated sludge, ver plants, *Sludge treatment, *Filtration, vent extraction, *Ozone, *Odor, *Froth flota- Leachates, Ionizing radiation, Tertiary treat-t, Controls, Ion exchange, Mathematical els, Cost-benefit analysis, Management.

collection of 36 papers on the subject of r treatment focuses on areas such as toxic erials control, biological treatment, electric er generating plant waste water treatment, ical chemical processes, destruction of con-nants, disinfection and odor control, and air tion. Toxic materials control covers such sub-as monitoring toxic spills, biological effects xic materials, and safety aspects, and control treatment of toxic substances. Biological e water treatment deals with: activated sludge ods; ion exchange/adsorption models in rela-to virus transport in percolating beds; and ter- alum-mud precipitation. Electric power rating plant waste water treatment covers es from fossil-fueled plants, recovery of dium originating as impurities in oil, dewater-of sludges, ash disposal, land application of le plant wastes, and whey application on far-d. Physical chemical processes includes: lopments in oil interception by filtration, pH rol using carbon dioxide, solvent extraction, staged ultrafiltration. Ozone technology is esented with papers on pretreatment of indus-wastes, comparison of ozone and ultraviolet ation for oxidation of waste waters and disin-on, and destruction of toxic compounds by ing radiation. Disinfection and odor control ides papers on on-site generation of chlorite solutions by electrolysis of seawater, odor problems. Also included are papers on in-d air flotation performance, sorption capabili-of various materials for treating leachates, and val of fluoborate from electroplating wastes. W79-00343 thru W79-00378) (Majtenyi-IPA)
-00342

NAGEMENT PLAN FOR CONTROL AND ATMENT OF TOXIC SUBSTANCES,
earch Corp. of New England, Wethersfield,

primary bibliographic entry see Field 5G.
-00346

UNOX PROCESS: EFFECTIVE WASTE-TER TREATMENT PRACTICE,
n Carbide Corp., South Charleston, WV.
. Vaseleski.
ilable from Copyright Clearance Center, Inc., York, NY as 0065-8812-78-9770-0178 ($0.95). Water -- 1977, AIChE Symposium Series, Vol. No. 178, edited by G. F. Bennett, p 23-28, 1978, 3 tab, 12 ref.

criptors: *Activated sludge, *Waste water ment, *Water purification, *Water pollution ment, *UNOX, *Oxygenation, Biological ment, Microbial degradation, Sludge, roorganisms, Aerobic bacteria, Aerobic condi-, Biological oxygen demand.

UNOX process is described as an improve-t on the currently accepted system of supply-microorganisms with oxygen during the activated sludge process for waste water purification. Instead of adding air to supply dissolved oxygen, UNOX uses high purity oxygen. As in other activated sludge systems, UNOX is composed of a biological reactor and a sedimentation tank. The biological reactor is divided into completely mixed stages by interior walls and is completely covered to provide a gas-tight enclosure. Liquid and gas phases flow concurrently through the reactor. Waste water, oxygen, and recycled sludge enter the first stage; however, oxygen enters at a slight pressure of 1-4 inches water column gage and flows from stage to stage with enough velocity to prevent backmixing. Because oxygen demand decreases as waste water progresses through the reactor, the net flow rate of gas is determined by the rate of gas mass transfer at each stage. An advantage of the system is that the high liquid phase dissolved oxygen provides a healthier biomass, which in turn, makes possible smaller tankage, smaller clarifiers, smaller dewatering equipment, and lower disposal costs. In addition, peak versus average load design is possible because the system can be allowed to drop to a dissolved oxygen of 2-3 during peak loading and/or oxygen feed can be increased. Such options do not exist with an air system. (See also W79-00342) (Majtenyi-IPA)
W79-00347

COMPARISON OF COMPLETE MIXED ACTIVATED SLUDGE AND UNOX TREATMENT OF BREWERY WASTES,
Flood and Associates, Inc., Jacksonville, FL.
B. A. Bell, and J. M. Welday.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9550-0178 ($1.05). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 29-36, 1978, 8 fig, 2 tab, 4 ref.

Descriptors: *Activated sludge, *Waste water treatment, *UNOX, *Oxygenation, *Waste treatment, *Water pollution treatment, Effluents, Aeration, Microbial degradation, Sludge, Aerobic bacteria, Biological oxygen demand, Wastes, Biological treatment, Brewery wastes.

A waste water treatment plant in Jacksonville, Florida, was the site of a study comparing the mixed activated sludge process and UNOX treatments of wastes. Although some results are described concerning the plant's original contact stabilization process, most interesting findings are those obtained during 1974 and 1975 when the plant was operated using the air-fed activated sludge process and 1975 to 1977 when it was operated using oxygen-free UNOX process. Major waste materials handled by this plant (Sewer District 2 Wastewater Treatment Plant) is brewery effluent which is high in suspended solids and 5-day biological demand (BOD5). The UNOX system proved superior for treating both types of pollutants. UNOX was able to average over 90% suspended solids removal compared to about 65% for the air fed activated sludge system. For the BOD5 removal, UNOX achieved 97.5% removal efficiency while the activated sludge process was about 53%. It is noted that these superior results were obtained at a time when the influent quality worsened; thus, it is concluded that UNOX pure oxygen process is better suited to handling characteristic brewery wastes. (See also W79-00342) (Majtenyi-IPA)
W79-00348

UNOX WASTEWATER TREATMENT SYSTEM PERFORMANCE SILICONE CHEMICAL COMPLEX,
Union Carbide Corp., Sistersville, WV.
R. A. Burton.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9875-0178 ($1.05). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 37-47, 1978, 11 fig.

Descriptors: *Activated sludge, *Waste water treatment, *Silicones, *Chemical wastes, *UNOX, Biological treatment, Aeration, Biological oxygen demand, Microbial degradation, Sludge, Separation techniques, Copper, Molds, Neutralization, Effluents, Oxygenation, Biological treatment, Alcohols, Ohio River.

The design, operation, and efficiency of the UNOX waste water treatment system at Union Carbide's Sisterville, West Virginia, Silicone Chemical Plant are discussed. The major contaminants of the plant are alcohols, toluene, metals, and some silicone oils. The treatment system design includes primary clarification with pH control and secondary treatment consisting of equalization, nutrient addition, holding basin, sludge drying/holding ponds, and two circular UNOX reactors, capable of 92% removal of biological oxygen demand (BOD). Problems that had to be solved included the clarifier recycle system, which initially was a floating bridge type mechanism. When this proved unreliable, a moving boom with hard rubber-covered metal wheels was installed which has functioned successfully. Other problems involved a high copper influent level, which was solved using a copper removal system before further processing, and low winter temperatures which were corrected by adding a rotary kiln. Also, a problem involving high levels of filamentous fungi was eliminated by increasing the sludge age and the food to microorganism ratio. Safety is maintained by careful monitoring of the reactors to detect any accumulation of combustible gas and incorporation of automatic failsafe devices. (See also W79-00342) (Majtenyi-IPA)
W79-00349

DESIGNING AND OPERATING AN OXYGEN ACTIVATED SLUDGE SYSTEM INCLUDING TERTIARY ALUM-MUD PRECIPITATION,
Gulf States Paper Corp., Tuscaloosa, AL.
R. R. Fuller, and D. W. Gilbert.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9661-0178 ($1.25). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. /Bennett, p 48-65, 1978, 6 fig, 6 tab, 3 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Organic wastes, *Industrial wastes, *Pulp wastes, *Alum-mud precipitation, Suspended solids, Biological treatment, Sludge, Effluents, Oxygenation, Sludge disposal, Drying, Incineration, Recycling, Dewatering, Biological oxygen demand, UNOX, Waste disposal, Pulp and paper industry.

Design of a waste disposal system for a pulp-paper complex located on a river with poor summer flow is described. The system required a special tertiary alum-mud precipitation in addition to conventional installations. The primary treatment includes a clarifier which removes 90% solids and 15% 5-day biological oxygen demand (BOD5) releasing an effluent containing 37 mg/l total suspended solids (TSS). Secondary treatment involves three UNOX oxygen activated sludge units, each of which has a throughput capacity of 10.67 million l/day. The average reduction across the secondary system is 86% when excessive loads are applied; thus, the tertiary clarifier was designed for treatment after the secondary clarifier. In the tertiary system, residual organics, including color and suspended solids are precipitated with 'alum-mud.' Experiments determined the best filter cloth and maximum open area for best hydraulic conditions. Dried cakes from the filter press are incinerated in a six hearth furnace. Ash from the furnace then passes to acid-brick lines reactor tanks where it is treated with sulfuric acid to convert aluminum oxide in the ash back to alum. It is concluded that precipitation systems, such as the alum-mud system, may be valuable for other industries, other than the paper industry, which have problems controlling loads of organics and suspended solids. Costs of construction and opera-

tion, and operating conditions and performance over a 2-year period are tabulated. Diagrams of the treatment system are supplied. (See also W79-00342) (Majtenyi-IPA)
W79-00350

EFFECTS OF DISSOLVED OXYGEN IN THE OXYGENATION ACTIVATED SLUDGE PROCESS,
NUS Corp., Houston, TX.
J. M. D'Antoni, and S. E. Steimle.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9823-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 66-74, 1978, 9 fig, 2 tab, 10 ref.

Descriptors: *Oxygen, *Dissolved oxygen, *Activated sludge, *Waste water treatment, *Oxygenation, Sludge, Benefits, Biological treatment, Waste water, Laboratory tests, Suspended solids, Organic loading.

The benefits of using dissolved oxygen in the oxygenation activated sludge process were studied using a laboratory pilot system especially developed for the purpose. A unit module reactor system was designed and constructed based on the UNOX process and a synthetic powdered-milk based synthetic waste water was used for the study. Test runs were carried out using various suspended solids concentrations and normal dissolved oxygen concentrations and then elevated oxygen concentrations. Resuls showed that more rapid and intense metabolic reaction of viable organisms developed under elevated oxygen conditions. Next five operational parameters were chosen as practical indicators of performance: substrate removal rate, sludge yield, total oxygen consumed, sludge volume index, and sludge settling velocity. Results, using these parameters, are tabulated for both batch treatment and continuous flow studies and it is concluded that there were marked differences in the activated sludge process caused by increased dissolved oxygen levels. These include improved substrate removal rates and sludge settling with reduced oxygen consumption and sludge yields. With increased organic and solids loadings, the benefits become more apparent, a point to be considered in designing new or upgrading existing facilities. Utilization of pure oxygen in the oxygenation process provides the ability to carry elevated levels of mixed liquor solids without developing oxygen limited conditions and eliminates possible oxygen stagnation. (See also W79-00342) (Majtenyi-IPA)
W79-00351

DYNAMICS AND CONTROL OF SUSPENDED SOLIDS IN A TWO-STEP ACTIVATED SLUDGE PLANT,
Lockwood, Andrews and Newnam, Inc., Houston, TX.
C. R. Coneway, and J. V. Matson.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1643-0178 ($1.05). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 75-83, 1978, 8 fig, 8 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Model studies, *Mathematical models, *Suspended solids, Sewage treatment, Municipal wastes, Houston, TX, Computer models, Waste water, Biological treatment, Sewage effluents, Waste treatment, Water pollution, Hydraulic properties.

A mathematical model for simulation of transient hydraulic peaks in the two-step oxygen activated sludge process is described as part of planning for a new waste water treatment plant in Houston, Texas. The model used describes one treatment train and includes both steps of the two-step process. It was developed based on mass and flow balances around each stage of the reactors and each of the clarifiers. The computer was used to perform several integrations simultaneously as required in the model. A sinusoidal flow pattern was used to simulate the diurnal variations in the incoming waste water and the simulation was conducted for a 48-hour period. Variations, such as peak wet weather characteristics and control actions for distribution of sludge, were programmed into the model. Results of computer simulation are recorded graphically. Design of the clarifier was aided by this study, especially such features as the ability to withdraw sludge from clarifiers, to control sludge blanket level, and to include sufficient depth to accommodate additional sludge mass resulting from abrupt flow rate increases. Also, it was demonstrated that gross process failure can occur as a result of a peak hydraulic surge through the plant. To solve this problem transfer of excess sludge to an adjoining train is recommended. (See also W79-00342) (Majtenyi-IPA)
W79-00352

APPLICATION OF ION EXCHANGE/ADSORPTION MODELS TO VIRUS TRANSPORT IN PERCOLATING BEDS,
California Univ., Los Angeles.
V. L. Vilker, L. H. Frommhagen, R. Kamdar, and S. Sundaram.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9469-0178 ($1.15). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 84-92, 1978, 8 fig, 2 tab, 17 ref.

Descriptors: *Mathematical models, *Waste water, *Percolation, *Ion exchange, *Viruses, Leachate, Activated carbon, Packed beds, Sewage, Water treatment, Soil water movement, Groundwater, Percolating water, Sludge treatment, Silts, Septic tanks, Ion exchange/adsorption equaions, Adsorption, Elution, Equilibrium.

Experimental and mathematical models are described for predicting breakthrough of low levels of virus from percolating columns. This research is aimed at developing better methods of predicting the magnitude of the threat of virus contamination of groundwater supplies by percolation from such sources as surface spreading of untreated and treated waste water, sludge land spreading, septic tanks, and landfill leachates. It included models for both adsorption (application of waste water to an uncontaminated bed) and elution (application of clean water to contaminated beds). The percolation/adsorption model consisted of a virus mass balance, an adsorption rate, and an equilibrium isotherm relationship. The data were obtained by measuring the equilibrium uptake of T4-phage from electrolyte solutions of known initial virus concentrations by known masses of activated carbon. The virus breakthrough is described by ion exchange/adsorption equations and the effects of external mass transfer and nonlinear adsorption isotherms are included. The predicted values obtained from the model experiments agree qualitatively with experiments carried out on virus transport through laboratory columns of silty soils or activated carbon. (See also W79-00342) (Majtenyi-IPA)
W79-00353

OXYGEN ACTIVATED SLUDGE CONSIDERATIONS FOR INDUSTRIAL APPLICATIONS,
AWARE, Inc., Nashville, TN.
C. E. Adams, Jr., W. W. Eckenfelder, Jr., J. H. Koon, and S. E. Shelby.
Available from Copyright Center, Inc., New York, NY as 0065-8812-78-9754-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 93-101, 1978, 9 fig, 6 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Industrial waste, *Oxygenation, *Biological treatment, *Evaluation, Waste treatment, Aeration, Hydrogen ion concentration, Organic compounds, Sludge, Suspended solids, Economics, Costs, Appraisals, Installation costs, Operating costs, Odor.

A number of factors are discussed which must be evaluated when assessing the relative merits of air oxygenated versus pure oxygen oxygenated activated sludge systems for industrial use. Organic removal kinetics may play a more important role in treating industrial wastes than municipal wastes because of their high strength. It is shown that a higher dissolved oxygen level in the aeration basin will result in a higher resistance to organic shock loadings and a more aerobic floc. A higher temperature because of the enclosure of the aeration basin is an advantage of the pure oxygen system, especially in cold climates. Equilibrium of the aeration basin pH can be a problem with the pure oxygen system because it intails a slightly lower pH. With highly acidic industrial waste waters it may be difficult to maintain pH to an acceptable range between 6.5 and 7.5. Also, the enclosed oxygen system may result in difficulties by retaining volatile organics which can inhibit the system. Pure oxygen systems are preferable to air oxygen systems for control of odors and susceptibility to shock loadings. Another factor to be considered is mixed liquor volatile suspended solids concentrations which can be handled effectively by both systems if they are properly designed; however the pure oxygen system does have the advantage of being able to supply sufficient oxygen to maintain relatively high mixed liquor or solids levels without requiring use of high power levels which would promote break-up of floc particles. Economically, a pure oxygen system costs more to construct but may offer substantial savings in operating costs, based mostly on the power requirements to achieve the necessary dissolved oxygen concentration. (See also W79-00342) (Majtenyi-IPA)
W79-00354

TREATMENT OF LIQUID WASTES FROM FOSSIL FUEL POWER PLANTS,
Ecodyne Corp., Union, NJ. Industrial Waste Treatment Div.
J. E. Brenman.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9047 ($0.75). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 102-108, 1978, 4 fig, 5 tab.

Descriptors: *Liquid wastes, *Power plants, *Fossil fuels, *Waste treatment, *Coals, Sulfur compounds, Runoff, Suspended solids, Fly ash, Heavy metals, Oil wastes, Industrial wastes, BPCTCA, BATEA, Standards, Water quality, Cleaning.

Six major sources of pollution from fossil fuel power plants are discussed in relation to methods appropriate for achieving the standards described for such facilities by the Environmental Protection Agency (EPA). Recommendations are given in each category on how to meet the 'Best Practicable Control Technology Currently Available' (BPCTCA) by July 1, 1977 and 'Best Available Technology Economically Achievable' (BATEA) by July 1, 1983. The six pollution sources discussed are: maintenance cleaning waste, stack gas sulfur dioxide removal, coal pile and miscellaneous area run-off, fly ash treatment, bottom ash, and sanitary waste. The substances found to be of major concern are suspended solids, oil and grease, and heavy metals. Removal of these substances is discussed under each category with ultimate efficiency to be dictated by the specific conditions of its generation. The BPCTCA and BATEA guidelines are tabulated and some specific recommendations to achieve them are made and estimated efficiency is summarized. (See also W79-00342) (Majtenyi-IPA)
W79-00355

OF WASTEWATER TREATMENT PONDS
VA FOSSIL FUELED POWER PLANTS,
ssee Valley Authority, Chattanooga.
Steiner, and D. G. Jahnig.
able from Copyright Clearance Center, Inc.,
York, NY as 0065-8812-78-1644-0178 ($1.85).
ater - 1977, AIChE Symposium Series, Vol.
o. 178, edited by G. F. Bennett, p 109-124,
4 fig, 6 tab, 9 ref.

iptors: *Waste water treatment, *Power
, *Sewage lagoons, *Fossil fuels,
essee Valley Authority, Ponds, Drainage,
streams, Chemical wastes, Liquid wastes,
water(Pollution), Legislation, Sedimenta-
Chemical precipitation, Absorption.

nent of chemical wastes produced by Ten-
e Valley Authority (TVA) fossil-fueled
plants is discussed with emphasis on use of
water ponds. Ponds are used at all TVA
to treat some part of the chemical wastes in-
g materials derived from the following
es: ash sluice water, boiler blowdown,
cal cleaning wastes, water treatment wastes,
s drainage wastes, sulfur dioxide, and
per wastes. The average size of these ponds
acres of 17% of total plant site area. They
vastes by sedimentation, chemical precipita-
and absorption methods and these methods
escribed in relation to compliance with
al water pollution standards. Some impor-
essons for design and maintenance of treat-
ponds are illustrated by descriptions of
ic experiences at the Colbert, John Sevier,
Kingston Steam Plants. Future concerns in
rea involve meeting standards required by
afe Drinking Water Act and new Environ-
l Protection Agency regulations controlling
pollutants. (See also W79-00342) (Majtenyi-

00356

RUMENTATION AND CONTROLS FOR
ADELPHIA ELECTRIC COMPANY ED-
ONE GENERATING STATION WASTE-
ER TREATMENT SYSTEM,
lelphia Electric Company, PA.
Beck, and F. C. Gloeckler.
able from Copyright Clearance Center, Inc.,
York, NY as 0065-8812-78-9489-0178 ($0.75).
ater -- 1977, AIChE Symposium Series, Vol.
o. 178, edited by G. F. Bennett, p 125-129,
7 fig.

iptors: *Waste water treatment, *Municipal
, *Controls, *Instrumentation, *Power
, Philadelphia, Waste water, Flow measure-
Flow control, Hydrogen ion concentration,
dity, Filters, Effluents, Industrial wastes,
ment.

esign and modifications of instrumentation
ontrols for the Philadelphia Electric Com-
s Eddystone Generating Station waste water
ent system are described. Modifications
required due mostly to equipment problems
naccurate initial influent waste flow rate
nination. Four major problems arose in
ting pH adjustment tanks which were cor-
by minor equipment modifications and
es in controls. Difficulties encountered in
ring controlling flow from holding tank
er pumps to clarifier, from settling basin to
arifier, and effluent flow to the river were
bed. Other problem areas were holding tank
ity and gravity filters. Operating experience
ted that a full time plant operator is needed
ure continuous plant operation. However,
sic instrumentation and control philosophy
proved satisfactory and plant discharge
y never violated regulatory limits. (See also
00342) (Majtenyi-IPA)
00357

DESIGN CONSIDERATIONS FOR WASTE-WATER TREATMENT SYSTEMS AT EXISTING FOSSIL POWER PLANTS,
Stone and Webster Engineering Corp., Boston, MA.
B. E. Dudzik.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1703-0178 ($1.35). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 130-139, 1978.

Descriptors: *Waste water treatment, *Power plants, *Design, *Fossil fuels, Sedimentation, Neutralization, Dewatering, Sludge, Waste water, Industrial wastes, Fly ash, Evaluation, Cost analysis, Pumps, Coal, Demineralization, Separation techniques.

Several alternatives for treatment of waste waters produced by fossil-fueled power plants are described for each of several waste sources. Floor and equipment drainage usually must be treated separately because of extensive chemical and/or physical processes required for most other wastes. Corrugated plant interceptors and corrugated plant separators are useful for removing suspended solids and save space over conventional separators. Specific recommendations are made for handling floor and equipment drainage wastes and results show flow rates from this source can be reduced by 75%. Suggestions are made for improving handling of water treatment system wastes including demineralizer wastes which may involve acid or caustic feed through a flow-through pH sensor. Equipment washing wastes cover those produced by removal of ash from equipment such as air preheaters, economizer, boiler firesides, and precipitator hoppers. Most effective methods of treating such wastes are: (1) adding dry high calcium quicklime and polyelectrolyte into a mixed tank or sump with about a 15-minute detention time and effluent pH of 9.0; (2) gravity sedimentation of solids produced from the lime addition; (3) final neutralization of resulting overflow to a pH suitable for direct discharge; (4) dewatering of collected sludge from gravity sedimentation. Each of these methods is analyzed with respect to space requirements, cost, and operating problems. Ash handling systems wastes discussed include oil fly ash and coal bottom ash. Bottom ash, in turn, is divided into slagging and non-slagging ash which require different treatments. (See also W79-00342) (Majtenyi-IPA)
W79-00358

WASTE TREATMENT FOR A PROFIT,
Long Island Lighting Co., Glenwood Landing, NY.
P. P. LaLena.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9080-0178 ($1.25). In: Water -- 1977, AIChE, Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 140-148, 1978, 8 fig, 2 tab, 10 ref.

Descriptors: *Waste treatment, *Power plants, *Recycling, *Vanadium, Oxidation, Reduction, Hydrogen ion concentration, Acidification, Lime, Filtration, Long Island Lighting Co.(LILCO), Ferrovanadate, Industrial wastes, Oil, Pilot plants.

Recovery of valuable vanadium originating as impurities in the Venezuelan fuel oil burned at power plants of the Long Island Lighting Company (LILCO) is described. Each barrel of oil burned contains 0.2 pounds of vanadium oxide (V_2O_5), making a total of 2.75 million pounds of vanadium consumed each year. Vanadium salts and oxides in the ash exist in various forms including V+4, V+5, metavanadate (VO-3), and orthovanadate (VO4-3) but when combined in furnace wash water, all forms tend to oxidize to the +5 state which is extremely water soluble. Original recovery efforts involved lime treatment, solids separation, and carbon removal in a fluidized bed combustor; however, in 1975, laboratory studies were begun to determine optimum recovery methods. These tests indicated that treatment with ferrous sulfate ($FeSO_4$) to reduce V+5 to ferrous vanadate ($Fe(VO_3)_2$) and subsequent pH adjustment to 9.5 with lime was an efficient method. Pilot plant studies confirmed this finding and determined more precise operating conditions. Now full scale treatment facilities are being constructed for two power stations of LILCO burning the high vanadium content oil at a cost of $11 million. On completion in late 1979, the additional annual income from sales of the recovered vanadium is expected to be $700,000. The filter cake to be produced will contain an iron-to-vanadium ratio of 0.25 to 0.30, and studies are underway on direct conversion to ferrovanadate (FeV) using reduction in plasma arc furnace. Potential for sales of FeV are estimated at $6 million a year. (See also W79-00342) (Majtenyi-IPA)
W79-00359

DEWATERING OF SLUDGES FROM OIL FRIED ELECTRIC POWER GENERATING PLANTS,
Enviro Development Co., Inc., Mountain View, CA.
M. M. Zuckerman, and R. V. Peltier.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1646-0178 ($0.75). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 149-157, 1978, 2 fig, 7 tab.

Descriptors: *Waste water treatment, *Sludge, *Chemical precipitation, *Power plants, Industrial wastes, Sludge disposal, Vacuum filtration, Filter press, Dewatering, Lime, Caustic, Cost analysis, Pilot plants, Cost-benefit analysis, Laboratory tests, Electric power industry, Copper, Iron.

The results of laboratory and pilot plant studies on sludges generated by oil-fired electric power generating plants are discussed as a guide to selecting a chemical precipitant for pollutant removal. The goal in treating waste water streams is to produce as low a volume of sludge as possible. In waste streams containing copper and iron, these metals are removed by chemical precipitation involving pH elevation using either caustic (sodium hydroxide) or lime (calcium oxide). Five considerations for choice of precipitant are discussed: chemical costs; storage, handling, and feed; quantity of sludge produced; size of waste water treatment equipment; and sludge dewatering ability. Although dry weights of copper and iron in sludge are approximately the same for either caustic or lime treatment, more carbonates and bicarbonates precipitate with lime than caustic; thus, more sludge is produced. However, the sludge produced by lime has the advantage of being more readily dewatered. Based on empirical data, vacuum filters and filter press are the two processes for dewatering lime and caustic sludges deemed cost effective. Conditions favoring choice of which method to use are described. For example, high proportions of chemical cleaning solutions favor filter press dewatering but large amounts of fly ash favor vacuum filtration. (See also W79-00342) (Majtenyi-IPA)
W79-00360

PRETREATMENT LAND APPLICATION OF TEXTILE PLANT WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W79-00362

NEW DEVELOPMENTS IN OIL INTERCEPTION BY FILTRATION,
Hydrotechnic Corp., New York.
R. Nebolsine, and A. H. Danzberger.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9205-0178 ($0.95) In: Water--1977, AIChE Symposium Series, Vol.

74, No. 178, edited by G. F. Bennett, p 187-196, 1978, 5 fig, 4 tab.

Descriptors: *Waste water treatment, *Industrial waste, *Oily waste, *Filtration, *Multimedia deep bed filtration(MMDB), Alum, Ferric chloride, Coagulation, Costs, Separation techniques, Suspended solids, Oil industry.

Use of multimedia deep bed filration (MMDB) technology is described for both secondary and tertiary treatment of oily waste waters of the petroleum industry. The process consists of removing suspended solids by straining through a deep filter bed of anthracite and sand. It was found that applying and mixing the right combinations of chemicals and/or polymetrs immediately ahead of the filter resulted in up to 90% removal of suspended solids. A typical MMDB operates at flux rates between 10-16 gpm/sf and uses a 3-5 ft bed of anthracite over a 2-3 ft bed of sand supported by 1 ft of gravel. Contact coagulation takes place within the bed when chemicals, such as ferric chloride and alum are added. There are a wide variety of applications for MMDB in treating oily waste waters from refineries, oil terminals, and oil fields, including; drainage and storm runoff water, ballast water, brines prior to injection into an oil field, and sea water, to condition it for injection into oil bearing formations. Capital costs of MMDB filters are discussed for plants in the 2.5 to 50 mgd range. Total costs of operation are covered, including energy, land area requirements, and chemical costs. (See also W79-00342) (Majtenyi-IPA)
W79-00364

PH CONTROL SYSTEMS USING CARBON DIOXIDE,
Airco Industrial Gases Div., Murray Hill, NJ.
R. M. Casciano.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9490-0178 ($0.75). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 197-203, 1978, 7 fig, 2 ref.

Descriptors: *Waste water treatment, *Hydrogen ion concentration, *Carbon dioxide, Neutralization, Acid effluents, Sodium hydroxide, Thiems equation, Acid-base equilibrium, Alkaline effluents, Equations.

Carbon dioxide (CO_2) can effectively replace sulfuric acid (H_2SO_4) for acidifying alkaline effluents. Using CO_2 is very efficient for lowering pH to 8.0 but inefficient below pH 8.0 because of the buffering effect of bicarbonates formed during treatment. Alkaline effluents can be treated directly with CO_2 but acidic effluents are candidates for using CO_2 also, if they are first made alkaline by adding sodium hydroxide. Then pH can be adjusted accurately using CO_2. The simplest method of CO_2 addition is to introduce the gas through an open-end standpipe at the bottom of the tank, a perforated pipe, or a perforated plate at the bottom of the tank. Theoretical CO_2 consumption is discussed using equilibrium equations both above and below pH 8. Examples illustrating calculations are included. (See also W79-00342) (Majtenyi-IPA)
W79-00365

SOLVENT EXTRACTION FOR TREATMENT OF WASTEWATERS FROM ACETIC-ACID MANUFACTURE,
California Univ., Berkeley.
N. L. Ricker, and C. J. King.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9624-0178 ($1.75). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 204-209, 1978, 3 tab, 14 ref.

Descriptors: *Waste water treatment, *Solvent extraction, *Acetic acid, Industrial wastes, Costs, Cost effectiveness, Recycling, Waste water, Pollutant identification, Solvents, Organic chemicals, Chemical oxygen demand(COD).

Waste waters from acetic acid plants can be treated successfully using the solvent extraction system; however, before determining what solvent or solvents to use, the composition of waste water must be examined to detect major pollutants. Commonly, these consist of formic and acetic acids, low molecular weight alcohols and aldehydes and have chemical oxygen demand between 5800 and 27,000. Once composition is known, the solvent can be chosen based on such criteria as: distribution coefficient for solutes to be removed, reactivity, ease of separability, low aqueous solubility, density, viscosity, and cost. Special problems are encountered with wastes containing organic acids and chlorinated acetaldehydes either because of complex formation or separation difficulties. Some promising solvents are discussed including 2-ethylhexanol and 50% cyclohexanone 50% 2-ethyl hexanol. In general, costs of extraction are high compared with biological oxidation processes but on the basis of recovered acetic acid, the solvent extraction process can be economical. (See also W79-00342) (Majtenyi-IPA)
W79-00366

MOLECULAR FRACTIONATION BY STAGED ULTRAFILTRATION,
Millipore Corp., Bedford, MA.
R. S. Tutunjian, and A. R. Reti.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9143-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 210-216, 1978, 9 fig, 1 tab.

Descriptors: *Filtration, *Membrane processes, *Waste water purification, *Molecular fractionation, Mathematical models, Waste water, Staged ultrafiltration, Separation techniques, Water treatment.

Ultrafiltration is a process which separates substances on the basis of their molecular size using membranes. It can be applied to industrial processes, such as virus control, cheese whey purification, colloid removal, and water treatment. The separation potential for a single membrane is such that it allows free passage only to substances which are 1/5 to 1/10 of the molelcular weight of the substances which it retains. Thus, good separation of molecules is impossible with one membrane. However, using several membranes staged in cascade fashion, separation of molecules having very similar sizes is possible. Using mathematical model techniques, a general solution was derived. It was demonstrated that, as the number of stages is increased, relative separation is increased. Experiments were carried out to examine some of the theoretical predictions and good correlation was observed. (See also W79-00342) (Majtenyi-IPA)
W79-00367

PRETREATMENT OF INDUSTRIAL WASTES WITH OZONE,
Gulf South Research Inst., New Orleans, LA.
F. H. Yocum, J. H. Mayes, and W. A. Myers.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9113-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 217-227, 1978, 12 fig, 7 tab, 12 ref.

Descriptors: *Waste water treatment, *Ozone, *Industrial wastes, *Oxidation, Mathematical models, Hydrogen ion concentration, Chemical reactions, Total organic carbon, Styrene, Ethylene glycol, Ethylene diamine, Toluene diisocyanate, Chlorine, Chlorides, Water pollution treatment, Biodegradation, Chemical industry.

Ozonation for treatment of biorefractory or har to oxidize compounds was investigated and foun to be effective. The experimental procedure i volved a stirred tank reactor and ozone was fe continuously at a rate of 11.5 l/m into a consta volume of waste water. An average test continue for 3 hours and samples were analyzed for total o ganic carbon (TOC). Also, mass transfer tes were done to evaluate the reactor characteristi and to correlate volumetric mass transfer coeff cient with power input and gas velocity. A math matical model was developed to evaluate the vol metric mass transfer coefficient for ozone transf into distilled water. Also, experiments were ca ried out at various temperatures and pH valu using four types of industrial waste waters: (waste from toluene diisocyanate process, co taminated with toluene, amines, and toluei diamine; (2) waste from an ethylene glycol plar containing ethyl glycol and other polyol co pounds; (3) styrene process waste water, contai ing styrene monomer; and (4) waste from ethylene diamine plant with high chloride a residual chlorine content. Results indicate th ozonation improved biodegradability of all fo wastes. Also, oxidation was increased at p values above 10 except for the toluene waste. Co of ozonation is admittedly prohibitive for mo requirements but may be acceptible if standar are made more stringent. (See also W79-0034 (Majtenyi-IPA)
W79-00368

NEW TECHNOLOGY: OZONE/UV CHEMICA OXIDATION WASTEWATER PROCESS FO METAL COMPLEXES, ORGANIC SPECI AND DISINFECTION,
Houston Research, Inc., TX.
H. W. Prengle, Jr., and C. E. Mauk.
Available from Copyright Clearance Center, In New York, NY as 0065-8812-78-9110-0178 ($1.4 In: Water--1977, AIChE Symposium Series, V 74, No. 178, edited by G. F. Bennett, p 228-2 1978, 15 fig, 7 tab, 9 ref.

Descriptors: *Waste water treatment, *Ozo *Ultraviolet radiation, *Disinfection, Inorga compounds, Organic compounds, Metals, Oxi tion, Refractory compounds, Waste water puri cation, Water pollution treatment, Total orga carbon(TOC), Refractivity, Gas chromatograph

Chemical oxidation of waste water using ozo can be augmented by ultraviolet (UV) light tre ment. The combined ozone-UV process, kno commercially as oxyphotolysis, was developed use on organic and inorganic materials as well for disinfection. Before actual studies were begu reactivity of refractory species were characteriz using a refractory index, UV spectrograms, a molecular structure analysis. Oxidation rate s dies were carried out on over 30 pure compoun and 15 composite industrial wastes and reactio were followed using gas chromatography, total ganic carbon (TOC) analysis, and pH measu ments to follow destruction of organic aci Sulfate and phosphate analyses were used to vestigate fate of sulfur and phosphorus, and t bimetric chloride analysis was done to determi whether chlorine went to chloride or some oth form. It was concluded that oxyphotolysis is eff tive for destruction of toxic or biorefractory pol tants. Metallic cyanides were destroyed comple ly, even the extremely stable iron cyanides. Re tivity and reaction rates correlated directly w UV absorption data; aromatic compounds abs more UV than aliphatics and are more reacti Reactions are driven to completion by UV ene input and the appropriate amount and frequen Oxyphotosis proved more effective for disinf tion than either ozone or UV separately and amount of ozone required is only 10% of dosage needed when ozone is used alone. (See a W79-00342) (Majtenyi-IPA)
W79-00369

DESTRUCTION OF TRACE TOXIC COMPOUNDS IN WATER AND SLUDGE BY IONIZING RADIATION,
Massachusetts Inst. of Tech. Cambridge.
E. W. Merrill, D. R. Mabry, R. B. Schulz, W. D. Coleman, and J. G. Trump.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9446-0174 ($0.75). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 245-250, 1978. 9 fig, 2 tab, 4 ref.

Descriptors: *Toxicity, *Waste water treatment, *Ionizing radiation, *Polychlorinated biphenyls, Sludge treatment, Sludge, Industrial wastes, Herbicides, Water pollution, Organic compounds, High pressure liquid chromatography(HPLC), Ultraviolet radiation.

Traces of toxic compounds, such as the herbicide monuron and two polychlorinated biphenyls (PCBs), 3,4,2-trichlorobiphenyl and 4 chlorobiphenyl, were successfully destroyed by ionizing radiation. Samples were irradiated using a 3 million electron volt Van de Graaff generator and results were analyzed using high pressure liquid chromatography (HPLC) anf ultraviolet (UV) spectra. Using simple aqueous solutions of monuron, over 96% of the LC peak disappeared after a radiation dose of 10 kilorads. To simulate actual sludge conditions, the PCBs were dissolved in soap solutions and extracted with hexane before irradiation. Results were followed using HPLC and, as with monuron, destruction was rapid as shown by disappearance of the peak corresponding to the parent PCB. In addition, the appearance of degradation peaks earlier in the chromatogram indicated the creation of substances more soluble than the parent compound, probably hydroxylated compounds. It is hypothesized that, in water, hydroxyl radical attack on the PCB and monuron is the principal mode of degradation and that doses of 10 kilorads would remove most of such contaminants. (See also W79-00342) (Majtenyi-IPA)
W79-00370

CHARACTERIZATION OF PERFORMANCE OF FULL-SCALE TERTIARY WASTEWATER GRANULAR MEDIA FILTERS,
Northwestern Univ., Evanston, IL.
J. A. FitzPatrick, and C. L. Swanson.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1089-0178 ($1.15). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 251-264, 1978, 13 fig, 4 tab, 8 ref.

Descriptors: *Waste water treatment, *Filtration, *Municipal wastes, *Tertiary treatment, *Sewage, Mathematical models, Suspended solids, Turbidity, Biological oxygen demand(BOD), Chicago, Granular media filters, Flocculation, Particle size, Evaluation, Sampling.

Evaluation studies were carried out on 8 small tertiary granular filtration plants in the Chicago area. Performance on such filters depends on such variables as media type, size, and depth, filtration rate, influent suspended solid concentration, influent particle size distribution, type of secondary process, and flocculation characteristics of solids. The study began by characterizing performance as a function of design and operational variables. Sampling was done at 24-hr intervals, with some shorter periods, and routinely analyzed for turbidity, suspended solids and biological oxygen demand (BOD). Based on the empirical data collected, a mathematical model was developed for filtration performance and tested against actual plant achievements. It was concluded that: total suspended solid removal efficiency is very strongly dependent on refiltration parameters; and if straining is the dominant particle collection mode, suspended solid removal efficiency is weakly dependent on filter media size and depth. (See also W79-00342) (Majtenyi-IPA)
W79-00371

ON-SITE GENERATION OF HYPOCHLORITE SOLUTIONS BY ELECTROLYSIS OF SEAWATER,
Diamond Shamrock Corp., Painesville, OH.
For primary bibliographic entry see Field 5F.
W79-00372

WASTEWATER ODOR PROBLEM SOLVING -- PROCESS MODIFICATION VERSUS AIR TREATMENT,
Research Corp. of New England, Wethersfield, CT.
R. E. Kenson, V. G. Boscak, and G. T. Brookman.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1647-0178 ($0.85). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 270-277, 1978, 5 fig, 3 tab, 7 ref.

Descriptors: *Odor, *Waste water treatment, *Air pollution, *Contamination(Air), Costs, Cost-benefit analysis, Pollutant identification, Evaluation, Performance.

Process modification is compared with air treatment as a preferred method of solving waste water odor problems. It is concluded that both methods can be cost effective if all the costs, both capital and operational, are considered, and all technically feasible solutions are examined before implementation. The following plan is recommended for solving such odor problems: (1) evaluation of odor emissions from both stack and open sources and their impact on ambient odors; (2) an engineering evaluation of alternate solutions including energy availability and costs; (3) design and construction of the chosen solution after review of each feasible control pros/cons. Some of the engineering measurements and evaluation are illustrated by specific examples including case histories of how odor problems were solved. (See also W79-00342) (Majtenyi-IPA)
W79-00373

CONTROL OF NUISANCE ODORS FROM PONDS BY THE USE OF BACTERIA CULTURES,
Rohm and Haas Kentucky Inc., Louisville, KY.
R. A. Jensen.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9093-0178 ($0.75). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 278-282, 1978, 2 ref.

Descriptors: *Odor, *Waste water treatment, *Air pollution, *Biological treatment, *Bacteria, *Sulfur bacteria, Anaerobic bacteria, Formaldehyde, Dissolved oxygen, Contamination(Air), Stagnant water, Bacterial culture.

Bacterial cultures can be used to eliminate offensive odors generated by sulfur-reducing anaerobic bacteria in stagnant ponds. The development of a successful bacterial treatment is traced over a three-year period during which experiments were carried out at an odor-producing landfill basin containing water in Louisville, Kentucky. A number of methods were applied without success, including; aeration, formaldehyde as a bactericide, and hydrogen peroxide to increase dissolved oxygen. The successful bacterial culture method took advantage of the favorable neutral pH and long residence time. The odor-producing area was innoculated with 'DEC Plus' dried bacterial culture at a dosage of 1 lb per 100,000 to 200,000 lbs water. Even though the temperature was below the optimum performance temperature for the bacteria, it was thought that this culture was capable of overriding the sulfide-producing bacteria and converting the biological action into an odorless mode. This proved to be true and, later, it was established that increasing the frequency of bacteria addition to six times a day reduces the possibility of the broth losing strength before use. The most effective method is to distribute active broth over the full surface of the pond. (See also W79-00342) (Majtenyi-IPA)
W79-00374

FACTORS INFLUENCING INDUCED AIR FLOTATION,
Petrolite Corp., St. Louis, MO.
C. W. Burkhardt, J. V. Janes, III, and D. W. Griffiths.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1068-0178 ($0.75). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 283-289, 1978, 5 fig, 3 tab, 10 ref.

Descriptors: *Waste water treatment, *Flotation, *Oily wastes, *Polyelectrolytes, *Ionization, Industrial wastes, Reaction rate constants, Froth flotation, Waste identification, Oil-water interfaces, Oily water.

The use of materials, such as hydrolyzing metal salts and cationic polyelectrolytes, was shown to produce up to 40-fold acceleration of the induced air flotation process for clarifying oily wastes. Assuming that a flotation aid must first interact with individual oil droplets, the research approach was to relate performance of a flotation aid to its affinity for the oil/water interface. Experiments were done to investigate the influence of ionic strength on solution properties and performance as air flotation aids of two cationic polyelectrolytes, Polymer C-76 and Polymer C-20. Electrolyte properties were determined and their performance as flotation aids was measured. Studies using emulsions of crude oil and water showed that clarification followed first order kinetics. However, in the presence of polyelectrolytes, the first order rate constant was found to be a function of polyelectrolyte concentration. Complete performance profiles were developed for each polyelectrolyte at 6 concentrations ranging from 1-5 mg/l. The data confirmed that clarification rate is accelerated by polyelectrolytes and performance improves as ionic strength increases. It is concluded that it may be reasonable to consider natural ion strength before choosing an appropriate flotation process. (See also W79-00342) (Majtenyi-IPA)
W79-00375

CRITICAL ANALYSIS OF FLOTATION PERFORMANCE,
Petrolite Corp., St. Louis, MO. Tetrolite Div.
R. J. Churschill, and K. J. Tacchi.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1067-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 290-299, 1978, 9 fig, 2 tab.

Descriptors: *Froth flotation, *Waste water treatment, *Flotation, *Comparative benefits, Industrial wastes, Dissolved gas flotation, Induced gas flotation, Water treatment, Performance, Evaluation.

Because air flotation is so widely applied and often is the only water treatment method used, an examination of the factors which affect process selection and performance was made. The two major methods currently in use, dissolved gas and induced gas, are described and some advantages of each are noted. Factors influencing flotation performance are identified as: (1) adhesion of bubble to a dispersed particle: (2) trapping of bubbles in a coagule or floc structure as the bubble rises; and (3) adsorption of bubbles into a coagule of floc as it forms. Considering these factors and the surface chemistry aspect of flotation, criteria for performance evaluation can be established. The dissolved gas and induced gas methods are discussed on this basis and some theoretical factors to be considered in designing such systems are described. Four specific examples using operating data from full scale flotation systems demonstrate that situations exist in which either process is ap-

plicable and will perform acceptably. (See also W79-00342) (Majtenyi-IPA)
W79-00376

SORPTION CAPABILITIES OF VARIOUS MATERIALS FOR LEACHATE TREATMENT,
New Jersey Inst. of Tech., Newark.
P. Chan, J. Liskowitz, A. J. Perna, M. Sheih, and R. Trattner.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9557-0178 ($1.15). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 300-308, 1978, 4 fig, 6 tab, 6 ref.

Descriptors: *Waste water treatment, *Leachates, *Sorption, Sludge, Industrial waste, Lysimeter, Fly ash, Activated carbon, Zeolite, Kaolinite, Hydrogen ion concentration, Water treatment, Metals, Performance, Evaluation, Total organic carbon, Chemical oxygen demand, Landfills.

To evaluate performance of natural and synthetic sorbents for removing components present in leachates from industrial sludge landfills, a series of lysimeter experiments was carried out. The sorbents investigated included: basic and acidic fly ash, bottom ash, Ottawa sand, activated carbon, illite, kaolinite, vermiculite, natural zeolite, cullite, and three sizes of activated alumina. The moisture content of the sludge was assessed to determine how much water should be mixed with a particular sludge to attain maximum concentration of pollutants. Then, concentrations of sludge in distilled water were prepared to give a ratio of 2.5 ml water per gram of dried sludge. The mixtures were stirred 24 hrs, filtered, and used for lystimeter studies. Parameters chosen to evaluate performance were: pH, conduction, chemical oxygen demand (COD), and total organic carbon (TOC). Leachates from three types of industrial sludge were tested using the sorbents listed. Results indicated that no single sorbent could remove all objectionable ions from the leachates studied, but a number of them exhibited removal capacity and retainability under dynamic conditions. A variety of specialized capabilities were noted. In general, the behavior of a sorbent, as regards removal of a particular contaminant, varies with the type of leachate being treated. Also, pH of the leachate is one of the prime factors in determining the effectiveness of the system. (See also W79-00342) (Majtenyi-IPA)
W79-00377

REMOVAL OF FLUOBORATE FROM PLATING WASTEWATER: TECHNIQUE AND MECAHNISM,
New Jersey Inst. of Tech., Newark.
V. N. Cagnati, R. H. Haralson, T. A. Hunter, J. W. Liskowitz, and A. J. Perna.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1648-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 309-315, 1978, 5 fig, 2 tab, 10 ref.

Descriptors: *Waste water treatment, *Flotation, *Ion flotation, *Fluoborate, Chemical reactions, Physical reactions, Surfactants, Foaming, Electrochemistry, Industrial wastes.

A technique for removal of fluoborate ion from waste waters of the electroplating industry is described and a reaction mechanism explained. Fluoborate, which is being substituted for other toxic ions in electroplating, is a tightly bound tetrahedral of four fluoride atoms symmetrically surrounding a centrally located boron atom. The diameter of this ion is only about 5A and this small size in addition to its symmetrical shape makes it more like an ionized single atom than a molecular ion. The removal process, called ion flotation, is a combination chemical-physical process in which a surfactant is added to the solution and the contaminant is foamed out of binding it so that it will be held when the surfactant is removed. A number of cationic surfactants were tested and found acceptable but two were chosen for use in actual flotation experiments, Armac-C (a 12-carbon Coco amine acetate) and Armac-T. Results indicated a maximum of 94% removal of fluoborate by Armax-T at the molar ratio of 3:5:1. Armac-C gave slightly lower removal percentages. The increase in removal capacity of Armac-T over Armac-C is attributed to the longer carbon chain of 18 atoms. The mechanism involves replacement of the acetate on the active site of the surfactant by fluoborate. (See also W79-00342) (Majtenyi-IPA)
W79-00378

RURAL WATER SUPPLIES FROM LATERITE RUNOFF,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W79-00387

PROCESS FOR PURIFYING AQUEOUS INDUSTRIAL EFFLUENTS.
CIBA-FEIGY Ltd., Basel (Switzerland). (Assignee).
British Patent No 1,499,387. February 1, 1978. 15 p, 40 claims, 2 tab.

Descriptors: *Adsorption, *Bleaching wastes, *Color, *Waste water treatment, *Patents, Textiles, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, Water pollution treatment, Waste treatment, Pulp and paper industry, Effluents, Water purification, Clays, Magnesium compounds, Decoloring, Adsorbents.

A process is provided for purifying industrial effluents, particularly for decolorizing waste waters from the paper or textile industries. The process involves bringing the effluent into contact with an adsorbent prepared by precipitating a basic nitrogenous polymeric compound onto a carrier with an activated clay mineral. For example, the adsorbent can be prepared by using activated magnesium bentonite to precipitate a polyamidepolyamine (derived from polymerized linoleic acid/linolenic acid and triethylenetetramine) onto bleached pine sulfite cellulose as the carrier. (Lynch-IPC)
W79-00399

WATER REUSE: A TRICKLE BECOMES A TORRENT,
For primary bibliographic entry see Field 3E.
W79-00400

USE OF HYDROLYSIS LIGNIN FOR PURIFICATION OF EFFLUENTS FROM AMMONIA PRODUCTION AND THE PREPARATION OF COMPLEX FERTILIZERS (PRIMENENIE GIDROLIZNOGO LIGNINA DLYA OCHISTKI STOCHNYKH VOD AMMIACHNOGO PROIZVODSTVA I POLUCHENIYA SLOZHNYKH UDOBRENII),
V. I. Meerovskaya, B. G. Ostrobrod, A. E. Kuznetsova, N. U. Rizaev, and S. A. Nerozin.
Doklady Akademii Nauk Uzbekskoi SSR, No. 4, p 46-47, 1977. 2 tab.

Descriptors: *Lignins, *Fertilizers, *Waste water treatment, *Ammonia, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Nutrients, Trace elements, Nitrogen compounds, Water pollution sources, Effluents, Cotton, Hydrolysis, Copper, Solid wastes, Byproducts, Pulp wastes.

The removal of carbon oxides during the production of ammonia with copper-ammonia solutions results in the accumulation of 5-20% ammonia, 0.1-0.2% copper, 2-4% carbon oxides, and 0.1-0.2% acetic acid in the effluents. A laboratory method was developed for treating copper-ammonia solutions with hydrolysis lignin in a solid/liquid ratio of 1:2 to 1:4. The product is then dried. Solutions treated in this fashion are completely free of copper. In addition, the product contains 99% organic material enriched with ammonium nitrogen and 0.1% copper, which is an important nutritional trace element. This material is used for producing a complex soil amendment for cotton plantations by additions of double superphosphate, urea, and urea-formaldehyde fertilizer. (Chern-IPC)
W79-00402

BIOLOGICALLY ACTIVE SUBSTANCES IN PULPING WASTE LIQUORS. I. SUBSTANCES ACTIVE AGAINST TERMITES, COPTOTERMES FORMOSANUS SHIRAKI, IN KRAFT PULPING AND BLEACHING WASTES,
Kochi Univ. (Japan).
K. Sameshima, N. Takamura, and E. Kamino.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol. 24, No. 1, p 65-70, January, 1978. 5 fig, 16 ref. 2 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Insects, *Water pollution effects, Wastes, Industrial wastes, Pulp and paper industry, Water pollution sources, Pine trees, Birch trees, Waste water treatment, Neutralization, Lime, Activated sludge, Water pollution treatment, Toxicity, Detoxification, Dialysis, Solvent extractions, Ion exchange, Ultraviolet radiation, Inorganic compounds, Salts, Sodium compounds, Sodium chloride, Sodium carbonate, Termites, Aluminum sulfate, Kraft pulping, Wood extractives, Insecticides.

Filter-paper disks were impregnated with laboratory kraft pulping and bleaching wastes from Pinus densiflora or Betula platyphylla, dried overnight at room temperature (20-30C), and placed in petri dishes along with termites (50 workers plus 5 soldiers per dish). Termite mortality was determined at 24-hr intervals during incubation in the dark at 30C. All the wastes were toxic to the termites. Four conventional effluent treatments (neutralization, alum, lime, and activated sludge process) failed to remove the toxicity from the pine kraft pulping waste. Resuls of termite exposure tests after dialysis, solvent extraction, ion-exchange, and ultraviolet irradiation suggested that the main active substances in the bleaching wastes (except the chlorination stage) also appeared to be inorganic salts, notably sodium carbonate, sulfate, and chloride. This confirms the value of the ancient practice of wood protection by salt impregnation and the important effects of salts in seawater on marine organisms. (Brown-IPC)
W79-00404

INVESTIGATION OF FACTORS AFFECTING BOD MEASUREMENT AND EXPERIENCE WITH THE 1-DAY BOD TEST,
National Council of Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5A.
W79-00405

STEAM STRIPPING REDUCES CONDENSATE AT WEYCO MILL,
Weyerhaeuser Co., Springfield, OR.
For primary bibliographic entry see Field 3E.
W79-00409

ON THE REMOVAL OF LIGNOSULFONATES AND CARBOHYDRATES FROM SULFITE PULP WASH WATERS WITH ACTIVATED CARBON (ZUR ENTFERNUNG VON LIGNINSULFONATEN UND KOHLENHYDRATEN AUS SULFITZELLSTOFF-WASCHWAESSERN MITTELS AKTIVKOHLE),
Technische Hochschule, Darmstadt (West Germany). Inst fuer Makromolekulare Chemie.
M. Gahin, and T. Krause.

Das Papier, Vol. 32, No. 3, p 97-101, March, 1978. 5 fig, 2 illus, 9 ref, 1 tab. English summary.

Descriptors: *Bleaching wastes, *Waste water treatment, *Activated carbon, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Pulp and paper industry, Pulp wastes, Lignins, Sulfonates, Effluents, Filtration, Filters, Organic compounds, Carbohydrates, Chromatography, Inorganic compounds, Beech trees(Fagus), Sulfite pulp, Lignosulfonates.

The effluent from the last washing stage of an unbleached beech sulfite pulp was filtered through granulated activated carbon. The filtrates and the untreated effluent were analyzed for lignosulfonates, carbohydrates, and inorganic constituents. Molecular weight distribution of the lignosulfonates was determined by molecular sieve chromatography. Filtration on activated carbon is shown to reduce the solids content of such wash water to about 40% of the original value and to remove practically all lignosulfonates and carbohydrates. (Ward-IPC)
W79-00410

PROCESS DESIGN INVESTIGATIONS FOR ALASKA PULP MILL WASTEWATER TREATMENT FACILITIES,
Edde (Howard), Inc., Bellevue, WA.
H. Edde, R. French, O. Mason, and T. Hosoi.
Progress in Water Technology, Vol. 9, No. 3 , p 599-609, 1977. 6 fig, 4 ref, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Pulp and paper industry, Alaska, Air, Oxygen, Activated sludge, Bleaching, wastes, Nutrients, Microorganisms, Biochemical oxygen demand, Sludge, Pilot plants, Dissolving pulp mills, Sulfite pulp mills.

The operation of air-activated and high-purity oxygen-activated biological effluent treatment pilot plants were compared in an investigation conducted by the Alaska Lumber and Pulp Co. Inc. (Sitka, Alaska), EKONO Inc., and Howard Edde Inc., Consultant Engineers (Washington). The performance of the UNOX activated sludge treatment system was superior to that of the air-activated system for treating the magnesium-base sulfite dissolving-pulp mill's effluent. When treatment of the chlorination-stage effluent from the bleach plant was bypassed, the recommended oxygen-aeration tank process design loading was a food/microorganism ratio of 1.0 as compared with 0.6 for air-activated sludge while obtaning high 5-day BOD removal. Similarly, the oxygen system had an allowable clarifier process design mass loading of 44 lb/sq ft/day and 4% underflow solids consistency compared with 30 lb/sq ft/day and 1%, respectively, for the air-activated sludge. Also, the oxygen system exhibited greater process stability during shock loading and following startup after extended mill shutdowns. The effluent from both the air-activated sludge and UNOX system satisfied the bioassay for LC(20) and LC(50). The fuel value of the excess biological sludge from either pilot plant was about 9,400 BTU/lb (oven-dry basis). (Swichtenberg-IPC)
W79-00412

EPA'S GOAL FOR SUSPENDED SOLIDS IS NOT MET WITH MEDIA FILTRATION,
Procter and Gamble Co., Cincinnati, OH.
C. D. Biskner, C. A. Barton, and J. H. Millican.
Pulp and Paper, Vol. 52, No. 5, p 126-128, May, 1978. 2 fig, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Filtration, *Suspended solids, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Sands, Coals, Water purification, Filters, Effluents, Coagulation, Cations, Polymers, Flow rates, Water pollution control, Dissolving pulp mills, Aluminum sulfate, *Water quality standards.

The performance of downflow and upflow dual-media filtration systems comprised of fine sand, coarse sand, anthracite coal, or combinations of these were compared in pilot plant studies conducted by Procter and Gamble Co. (Cincinnati, Ohio) and E. C. Jordan Co. (Portland, Maine) at the dissolving-pulp mill of Buckeye Cellulose Corp. near Perry, Florida. The type of filter media has little effect on the removal of total suspended solids (TSS) from the secondary (biological) treatment effluents. The addition of coagulant chemicals (viz., alum and a cationic polymer) raises the filter effluent TSS above the influent TSS level prior to coagulation. The best performance of granular media filtration that could be expected at a mill with secondary treatment effluent TSS ranging from 30 to 40 mg/liter would be 18 mg/liter (as compared to EPA's goal of 10 mg/liter) with an annual average of 20-25 mg/liter. The filters would have to be operated at a flow rate of 2 gal/min/sq ft to achieve these levels. (Swichtenberg-IPC)
W79-00414

ENERGY CONSUMPTION FOR ELECTRODIALYSIS OF SPENT SULFITE LIQUORS (ENERGOZATRATY NA ELEKTRODIALIZ OTRABOTANNOGO SHCHELOKA SUL'FITNO-TSELLYULOZNOGO PROIZVODSTVA),
V. A. Kirsanov, V. A. Smirnova, and L. A. Mazitov.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatel'skii Institut Bumagi, No. 10, p 216-220, 1975. 1 fig, 1 ref, 2 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Electrodialysis, *Energy, Wastes, Industrial wastes, Water pollution treatment, Electrical resistance, Water pollution control, Membrane processes, Dialysis, Separation techniques, Pulp and paper industry, Water pollution sources, Spent sulfite liquor.

In a study of the electrodialytic processing of magnesium-base spent sulfite pulping liquors of various concentrations, the effect of the electric resistance of the electrodialysis cell on the energy consumption was investigated, and calculations were made of the energy consumption during the consecutive stages of the process. The energy consumption was found to increase with increasing current density, but the use of low-density current is not justified in view of the relatively high amortization rate of the equipment. A compromise between the high energy consumption of high current density and the low efficiency of the equipment at low density involves a stepwise treatment of the spent liquor, i.e., diminishing the current density in consecutive stages of the process. In this case the overall energy consumption is within acceptable limits at sufficiently high efficiency of the process. (Stapinski-IPC)
W79-00416

ELECTRIC RESISTANCE OF THE CATION-SELECTIVE MK-40 MEMBRANE DURING ELECTRODIALYSIS OF SPEND SULFITE LIQUOR (ELEKTROSOPROTIVLENIE KATIONOSELEKTIVNOY MEMBRANY MK-40 PRI ELEKTRODIALZE OTRABOTANNOGO SUL'FITNOGO SHCHELOKA),
For primary bibliographic entry see Field 5A.
W79-00417

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 1. ULTRAFILTRATION OF EFFLUENTS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES,
Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Wood Chemistry.
K. Pfister, and E. Sjostrom.
Svensk Papperstidning, Vol. 81, No. 6, p 195-205, April 10, 1978. 9 fig, 37 ref, 6 tab.

Descriptors: *Bleaching wastes, *Pollutants, Chlorine, Hypochlorite, Chlorine dioxide, Oxygen, Alkaline extraction, Pulp wastes, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Organic matter, Carbon, Color, Biochemical oxygen demand, Toxicity, Pine trees, Effluents, Lime, Chemical precipitation, Waste water treatment, Waste treatment, Biological treatment, *Ultrafiltration, Oxygen bleaching, Bleaching agents, Molecular weight.

Spent liquors from laboratory bleaching of pine kraft pulp by the conventional CEH sequence were compared with effluents from oxygen (OCE and ODE) sequences. The dissolved material was fractionated by ultrafiltration (M below 1000, between 1000 and 10,000, and over 10,000) and analyzed for organic dry matter, organic carbon, permanganate-number, color, BOD, and toxicity. The main part (65-70% of the dissolved material) was found in effluents from the alkaline-extraction (E) stage of the CEH sequence and from the oxygen stage in the OCE and ODE sequences. Liquors from the C (chlorination), D (chlorine dioxide), and H (sodium hypochlorite) stages contained up to 60% low-molecular substances (M below 1000) and less than 10% high-molecular (M above 10,000) material. In contrast, 80-90% of the material which dissolved in E-stage liquors had molecular weights above 1000. Of the total color load (173 kg Pt/ton of pulp) in the CEH sequence 80% originated from alkaline extraction. Color loads from the OCE and ODE sequences were 34 and 8 kg Pt/ton, respectively, assuming 100% recovery of oxygen-stage liquors. Most of the color for all spent liquors derived from the M fraction above 1000. The 7-day BOD of the CEH effluent was about 12 kg oxygen/ton of pulp, to which the C-stage contributed 50%, the E-stage 40%, and the H-stage 10%. The 7-day BOD loads of the CE and DE stages following an oxygen stage were 5 and 3.5 kg oxygen/ton, respectively. Most of the BOD in the C, H, and O-stage liquors came from the low molecular (M below 1000) fractions, whereas high-molecular material contributed more than half of the BOD load in the E and D-stage effluents. The C-stage liquors contained by far the most toxic substances. Possible purification of spent bleach liquors by ultrafiltration, lime precipitation, and biological treatment are also discussed. (Brown-IPC)
W79-00419

THE CLOSED MILL CONCEPT,
International Paper Co., Mobile, AL.
For primary bibliographic entry see Field 3E.
W79-00420

CLARIFIER WITH SUSPENDED LAYER OF SEDIMENT (OSVETLITEL' SO VZVESHENNYM SLOEM OSADKA),
Ogrskaya Karonnaya Fabrika, latvia SSR.
R. A. Kudryashova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 35, p 6, December, 1977. 1 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Clarifiers, Water conservation, Industrial water, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Suspended solids, Biochemical oxygen demand, Effluents, Kaolin, Fibers(Papermaking), Board mills.

A continuous clarifier is described for removing suspended solids from paperboard manufacturing effluents. The clarifier is composed of a metal-finished cone with a 5 m diameter, 7.8 m high cylinder reservoir which is divided into central distributing, suspended sediment, clean water, and settled sediment sections. Throughput of the clarifier is 90-110 cu m/hr. Operating temperature is 8-22C at atmospheric pressure. Effluent retention

time in the suspended sediment and clean water sections was 20-30 and 20 min, respectively. The suspended solids content in the effluent was reduced from 400 to 10-20 mg/liter. Fiber and kaolin removal was 96-98%; 5-day BOD was reduced 63%. With this system 6-70% purified water instead of fresh water can be used in board manufacture. (DuVall-IPC)
W79-00421

DEVELOPMENT OF AN EFFLUENT-FREE SULFITE PULP MILL (ENTWICKLUNG ZUR ABWASSERFREI ARBEITENDEN SULFIT-ZELLSTOFF-FABRIK),
R. Hornke.
Wochenblatt fuer Papierfabrikation, Vol 106, No 6, p 247-248, 250, March 31, 1978. 4 fig, 1 tab.

Descriptors: *Water pollution control, *Sulfite pulp mills, Pulp and paper industry, Water pollution sources, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Bleaching wastes, Pulp wastes, Evaporation, Burning, Condensates, Effluents, Sulfite liquors.

This proposal visualizes a system in which the effluents from the sulfite digestion of wood handled separately from those of the pulp bleach plant. The former which are rich in lignosulfonates are evaporated and burned, and the condensates reused. The latter which are rich in alkali and chlorine compounds will require different treatments, depending on the type of bleach. While the closure of the chemical pulping system has been successful in burning 99.8% of the total organic waste liquor content, the closing of a separate bleach-plant system will require further research and development work. (Ward-IPC)
W79-00424

STUDIES OF ION EXCHANGE AND CHELATION COMPOUNDS ADSORBED ON GRANULAR GRAPHITE,
West Virginia Univ., Morgantown.
J. L. Hern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 179, Price codes: A04 in paper copy, A01 in microfiche. PhD Dissertation, Part One, p 1-60, 1976. 13 fig, 3 tab, 14 ref. OWRT A-030-WVA(2) (Part 1), 14-34-0001-6051.

Descriptors: *Acid mine water, *Cation exchange, *Chelation, *Electrodes, *Ion exchange, *Water treatment, Adsorption, Chemical analysis, Chemical properties, Chemical reactions, Chemistry, Chromatography, Electrochemistry, Cation exchange medium, Chelation chromatography, Coke, Graphite, Metal ions.

Several compounds that have particular ion exchange or chelation properties have been adsorbed on granular graphite and coke. The resulting materials exhibit ion exchange and chelation properties similar to typical commercial exchange resins used for separations involving metal ions. However, the exchange capacities are lower (approximately 1000 times) than commercial materials. Particular attention has been devoted to the immobilization of several metals on Eriochrome Black-T modified graphite columns. Separation of Fe(3+) from multicomponent solutions of Fe(3+), Ni(2+), Co(2+), Mg(2+), and Ca(2+) possible by adjusting the pH of these solutions. Frontal analysis chromatography has been carried out utilizing EBT-graphite packing material for regular LC and HPLC techniques. Fe(3+) and Ni(2+) can be separated by HPLC using this modified graphite. Application of an electrical potential also is an effective method of removing metal ions from the modified graphite columns. The mechanisms of this removal is thought to be the electrochemical generation of H(+) ion. The removal of metal ions from aqueous solutions by formation of the metal hydroxides within granular electrode beds has been explored briefly. This is carried out by producing OH(-) ion electrochemically within the electrode bed, which results in metal hydroxide precipitation. (See also W79-00432)
W79-00431

CONTINUOUS ELECTROCHEMICAL SYNTHESIS USING A PACKED GRANULAR ELECTRODE,
West Virginia Univ., Morgantown.
J. L. Hern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 180, Price codes: A05 in paper copy, A01 in microfiche. PhD Dissertation, Part Two, p 61-130, 1976. 17 fig, 3 tab, 18 ref. OWRT A-030-WVA(2) (Part 2), 14-34-0001-6051.

Descriptors: *Acid mine water, *Electrochemistry, *Electrodes, *Synthesis, *Water treatment, Anions, Cations, Chemical properties, Chemical reactions, Chemistry, Electrolysis, Ions, Ion exchange, Organic compounds, Continuous flow cell, Electrochemical synthesis, Granular electrode, Graphite, Reaction mechanisms.

An electrochemical synthesis has been studied and a continuous flow cell utilizing granular graphite or platinum dust for quantitative electrolysis has been developed. The synthesis reaction proceeds by way of electrochemical radical anion production followed by a homogeneous solution reaction. It is concluded that the electrochemical cell does function, but because of uncompensated resistances when used in aprotic organic solvents of low conductivity, product yields are very low for the p-iodonitrobenzene system. The anion radical produced for the reduction of p-iodonitrobenzene has been observed by ESR and compared to the radical produced in the presence of CN(-) ion. The electrochemical reaction has also been studied by cyclic voltammetry at room temperature and -45C. A reaction mechanism for the replacement of I(-) by CN(-) has been suggested and compared to that previously reported in the literature. A qualitative discussion of the resistances encountered in the granular beds is also presented. (See also W79-00431)
W79-00432

DISTRIBUTION OF HETEROTROPHIC AND NITRIFYING BACTERIA WITHIN THE AEROBIC-MEDIA TRICKLING FILTER,
West Virginia Univ., Morgantown.
G. W. Gillespie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 175, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, 1977. 90 p, 6 fig, 32 tab, 27 append. OWRT A-036-WVA(1), 14-34-0001-7104.

Descriptors: *Aerobic treatment, *Nitrification, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Oxygen, Secondary treatment, Solids contact processes, Treatment, Wastes, Waste treatment, Water pollution treatment.

Distritbution and densities of the heterotrophic and nitrifying bacteria within the aerobic-media trickling filter (AMTF) were evaluated for response to changing detention times and nitrogen loadings. Comparison of the total mean densities obtained during each experiment indicated that nitrification within the AMTF reactor was dependent upon the activity of the nitrifying bacteria and not their densities. In general, increasing the detention time resulted in an increase of the nitrifying efficiency of the AMTF reactor. However, in some instances, increasing the detention time caused a reduction in the nitrification potential (nitrifying density) of the system. Comparison of the microbial densities of each site examined within the AMTF unit indicates that the heterotrophic and nitrifying bacteria are distributed throughout the entire depth of the reactor. No population profiles to reflect the changing water quality were observed.
W79-00433

AEROBIC MEDIA TRICKLING FILTER APPLIED TO NITROGEN CONTROL,
West Virginia Univ., Morgantown.
P. B. Huff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 140, Price codes: A07 in paper copy, A01 in microfiche. M.S. thesis, 1977. 127 p, 19 fig, 23 tab, 31 append. OWRT-A-036-WVA(2), 14-34-0001-7104.

Descriptors: *Aerobic treatment, *Nitrification, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Nitrogen, Oxygen, Secondary treatment, Solids Contact Processes, Treatment, Wastes, Waste treatment, Water pollution treatment, Filtration.

This bench-scale study demonstrates the ability of the aerobic media trickling filter (AMTF) to successfully nitrify, when used as the second stage in a two stage carbon-nitrogen of aerobic slime attached to an inert media. The uniqueness of this system is the aeration provided by the media which permits the media to be submerted rather than requiring the void spaces to insure the availability of oxygen. There are 276 hollow teflon tubes which comprise the media. Each one has a 0.762 mm diameter and is bonded into a pressurized oxygen manifold at the top of the unit. These tubings hang the entire 196.0 cm of the vertical 39.0 mm diameter pipe which flows full of wastewater. Diffusion of oxygen through the 0.229 mm thick walls of the tubings provides the oxygen requirements for nitrification of the wastewater. The hydraulic loading was varied by adjusting the flow rate of the synthetic sewage feed. Substrate loading was altered by changing the concentration of the synthetic sewage. This AMTF system provides complete nitrification of secondary sewage. When compared to other trickling filters, plastic and rock, it surpasses them in efficiency. The AMTF also requires less volume for the same removal than the rotating biological contactor and is competitive with the packed bed reactor. The Hy Flo unit has a size advantage, but the AMTF does not require the recirculation.
W79-00445

THE FEASIBILITY OF USING FOREST LANDS FOR RECYCLING SLUDGE NUTRIENTS IN NORTHERN NEW ENGLAND,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 5E.
W79-00446

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES,
Chicago Univ., IL.
For primary bibliographic entry see Field 6D.
W79-00453

A PILOT PLANT TRIAL FOR OZONE STERILIZATION OF FISH HATCHERY WATER,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 5G.
W79-00455

A STUDY FOR IMPROVING THE AEROBIC-MEDIA TRICKLING FILTER,
West Virginia Univ., Morgantown.
W. R. Johnson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 115, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1976. 97 p, 13 fig, 9 tab, 15 append. OWRT A-029-WVA(1), 14-31-0001-6051.

escriptors: *Aerobic treatment, *Oxygenation, Sewage treatment, *Trickling filters, *Waste ater treatment, Aeration, Biological treatment, quipment, Filters, Oxygen, Secondary treatent, Solid Contact Processes, Treatment, Waste eatment, Wastes, Water pollution treatment, erobic media, Aerobic-media trickling filter.

nprovements in the original design and additional formation about the operational capabilities are emonstrated in this bench-scale study of the erobic-media trickling filter (AMTF), a new conept of biological wastewater treatment. The niqueness of this fixed growth system is that the ert media also provides aeration. The aerobic edia consists of 276 small teflon tubes bonded to a pressurized oxygen manifold at one end of e unit and hanging in loops down the length of a ertical pipe flowing full of wastewater. Diffusion f pressurized oxygen through the very thin walls f the tubes provides the oxygen requirements. ecirculation is used to vary the hydraulic loading n the unit. Organic loading is varied by changing ie concentration of the synthetic wastewater. his AMTF system accomplishes greater than 85 ercent remova of BOD and is not adversely afected by excessive accumulations of slime. Its erformance at high organic and hydraulic oadings indicates it would be amenable to secondary treatment of industrial and municipal wastevaters or would perform well in a roughing rocess. Preliminary information also indicates a rge unit-volume reduction in the AMTF comared to an oxygen-activated sludge unit or a lastic-media trickling filter.
V79-00457

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES TUNNEL SYSTEM.
Booz-Allen Applied Research, Bethesda, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 482, rice codes: A20 in paper copy, A01 in microfiche. Draft Environmental Impact Statement, March 977. 468 p, 117 fig, 53 tab, 10 append. EPA 68-01-378.

Descriptors: *Tunnels, *Illinois, *Sewers, Effects, Water storage, Drainage, Urban runoff, Sewage, Tunnel construction, Tunnel design, Environment, Rock, Groundwater, Infiltration, Waste water treatment, *Chicago(Ill), Des Plaines Tunnel, Environmental impact statements.

This environmental impact statement concerned he Lower Des Plaines Tunnel System, which consists of one waste treatment plant and one main torage reservoir. The tunnel system will reduce he pollutant load currently discharged to Chicago's waterways. Adverse effects include ock spillage, temporary public annoyance during onstruction, and possible groundwater infiltraion or wastewater infiltration. (Sims-ISWS)
V79-00465

5E. Ultimate Disposal Of Wastes

EFFECTS OF MUNICIPAL SEWAGE EFFLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5C.
V79-00009

METHOD OF DISPOSING OF WASTE WATER CONTAINING EMULSIFIED OIL,
Sumitomo Electric Industries Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W79-00020

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, IL. (Assignee).
For primary bibliographic entry see Field 5G.
W79-00034

TRANSPIRATION AND EVAPORATION OF SEWAGE EFFLUENT,
Auburn Univ., AL. Engineering Experiment Station.
For primary bibliographic entry see Field 5D.
W79-00088

WASTE TREATMENT FOR A PROFIT,
Long Island Lighting Co., Glenwood Landing, NY.
For primary bibliographic entry see Field 5D.
W79-00359

CASE HISTORY: ASH DISPOSAL FROM AN OIL FRIED CENTRAL STATION,
Canal Electric Co., Sandwich, MA.
S. R. Hall, R. W. Jones, B. W. Lyons, and P. W. Pouliot.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9048-0178 ($0.75). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 158-162, 1978, 7 fig.

Descriptors: *Waste treatment, *Power plants, *Dewatering, *Sludge, Industrial wastes, Filtration, Magnesium oxide, Vanadium, Sludge disposal, Sludge treatment, Vacuum filtration, Drying, Slurries, Sulfur compounds, Recycling.

The ash disposal system of an oil-fired power plant run by Canal Electric Co. (CEC) of Sandwich, Massachusetts, is described. Because oil used in this plant contains vanadium and sulfur compounds, magnesium oxide (MgO) is added before firing to produce a dry friable ash and protect against corrosion effect of vanadium oxide (V205). Based on experiences of neighboring plants, CEC decided on the following system for handling ash: (1) keep ash in hoppers dry and hot (300F); (2) let ash released in precipitator fall freely into sluicing water flowing in the bottom of the lines to a waste sump; (3) pump ash slurry to a convenient point for dewatering before disposal; (4) during boiler outages, remove the dry ash collected in furnace and ducts with manual labor or vacuum equipment and wash down remainder with resulting washwater going to waste sump. After an investigative period during which dewatering equipment was rented, CEC decided to install Eimco vacuum drum, belt type filter equipment. The water to the thickener contains 150 to 400 mg/l suspended solids and the sludge produced contains approximately 15% solids. This is reduced to a cake form of 35% solids and 65% moisture at the end of the filter belt. These cakes are transported to purchaser for recovery of vanadium . (See also W79-00342) (Majtenyi-IPA)
W79-00361

PRETREATMENT LAND APPLICATION OF TEXTILE PLANT WASTES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash, H. C. Koise, D. Rock, R. Marshburn, and D. Pal.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1645-0178 ($1.55). In: Water--1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 163-175, 1978, 5 fig, 7 tab, 5 ref.

Descriptors: *Industrial wastes, *Waste treatment, *Textiles, *Soil treatment, *Sludge disposal, Soil tests, Soil types, Clay loam, Soil-water-plant relationships, Soil survey, Cost-benefit analysis, Sludge, Aerobic treatment, North Carolina, Soil chemistry, Crops, Waste assimilative capability, Sludge digestion, Nitrogen cycle.

The use of sludge from a nylon polyester plant for land application was studied and found to be technically feasible and economically attractive. However, reliable operating conditions and favorable economics depend on site specific design. Thus, extensive soil tests must be done, fundamental soil treatment mechanisms must be considered, and waste constituents and land needs must be defined. In the study done on waste produced by the American Enco plant in Clemson, South Carolina, three parameters were characterized: waste constituent generation, waste assimilatory capability, and land limiting constituent. Soil studies revealed that general soil characteristic is Hiwassee, consisting of sandy clay loam and sandy loam with substantial amounts of micaceous, non-expanding clay minerals. Soils are not expected to swell and shrink significantly with wetting and drying. Nitrogen, phosphorus, and oxygen demands of vegetative matter were reviewed and considered in final system design, which was ultimately based on nitrogen land area requirements. The system chosen includes two parallel aerobic digesters of 40,000 gal capacity which require between 10 to 20 days to produce applicable waste. The total waste system cost $1.15 million with sludge application accounting for an estimated $95,000. This was considered more economical than other systems evaluated. (See also W79-00342) (Majtenyi-IPA)
W79-00362

EFFECT OF WHEY APPLICATION ON CHEMICAL PROPERTIES OF SOILS AND CROPS,
Kraft, Inc., Glenview, IL.
D. S. Watson, A. E. Peterson, and W. G. Walker.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9811-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 176-186, 1978, 10 fig, 4 tab, 6 ref.

Descriptors: *Waste disposal, *Industrial wastes, *Whey, *Crop response, *Soil treatment, Soil water movement, Soil chemistry, Nutrients, Nitrogen, Phosphorus, Potassium, Soil properties, Irrigation, Experimental farms, Groundwater, Sinks, Dairy industry.

Land disposal of whey derived from Kraft, Inc. dairy processing plants was evaluated. Studies were carried out at experimental farms on the effects of spreading whey on soil or adding it in irrigation water. Results indicated that whey is beneficial to plants requiring large amounts of nitrogen. Tissue analysis was done to determine use of various elements found in the whey and indicated that calcium-phosphorus balance may be affected; but, even under maximum dosing conditions, no significant effect on the suitability of corn as animal feed was detected. Buildup of phosphorus and potassium in the soil were studied and these elements showed little tendancy for downward movement in the soil. Buildup is in direct proportion of the amount of applied in the whey. It is concluded that the soil acts as a vast sink for holding these nutrients until required for further crop production. Plant nutrients in whey sometimes move down into the soil beyond the principal root zone, occasionally to a depth of 9 feet in some areas. However, the likelihood of soil nutrients passing through the examined zones into groundwater does not appear significant and a brief examination of groundwater at one site confirmed this. (See also W79-00342) (Majtenyi-IPA)
W79-00363

SLUDGE TREATMENT BY SUPERSONIC JET-FLAME,
Tokyo Univ., Tokyo (Japan).
Z. Hokao.
Japan Pulp and Paper, Vol. 15, No. 3, p 43-48, October, 1977. 6 fig, 1 illus.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Heat treatment, Burning, Disposal, Incineration, Pulp and paper industry, Sludge, Water pollution sources, Water pollution control, Mathematical studies, Estimating equations, Equations, Cooling water, Temperature, Costs, Thermal insulation, Oil spills, Absorbents, Ultimate disposal.

The ignition of kerosene-fired jet burners used in the treatment of paper mill sludges (about 80% moisture content) is described. Mathematical equations are presented for calculating the nozzle-exit and throat temperatures, velocities, and specific weights; the throat pressure and cross-sectional area; the air flow rate; and the amount of cooling water required to protect the nozzles and combustion chamber. A flow sheet and cost data are given for a jet-flame plant treating paper mill sludge. Studies are reviewed in which the cotton-like product is used as an oil absorbent or heat insulator. (Swichtenberg-IPC)
W79-00403

A STUDY OF THE FATE OF BIOSOLIDS FROM BIOLOGICALLY TREATED EFFLUENT IN LABORATORY AND CONSTRUCTED STREAMS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5C.
W79-00407

SURVIVAL AND EARLY GROWTH OF SELECTED TREES ON WASTE WATER APPLICATION SITES,
North Central Forest Experiment Station, St. Paul, MN.
J. H. Cooley.
Department of Agriculture, forest Service, Research Note NC-231, 4 p, 1978. 1 ref, 4 tab.

Descriptors: *Irrigation, *Trees, *Sewage effluents, Wastes, Waste water disposal, Waste water(Pollution), Water pollution sources, Oxidation ponds, Effluents, Ash trees(Fraxinus), Oak trees(Quercus), White-cedar trees(Thuja occidentalis), Cottonwood(Populus delroides), Weeds, Conifers, Deciduous trees, Larch trees(Larix), Poplar trees(Populus), Hybrids, Tulip-trees(Liriodendrion).

The response of six tree species (Larix leptolepis, Larix decidua, Liriodendron tulipifera, Quercus rubra, Fraxinus pennsylvanica, and Thuja occidentalis) and three Populus hybrids to irrigation with oxidation pond effluent were compared. When weeds were intensively controlled, a Populus deltoides x nigra cross responded best, but when weeds were less intensively controlled, P. canescens x tremuloides responded best. (Witt-IPC)
W79-00422

A NOTE ON EFFECTS OF SEWAGE EFFLUENT IRRIGATION ON SPECIFIC GRAVITY AND GROWTH RATE OF WHITE AND RED OAKS,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
P. S. Szopa, L. C. Tennyson, and E. A. McGinnes, Jr.
Wood and Fiber, Vol. 8, No. 4, p 253-256, Winter, 1977. 3 fig, 9 ref, 1 tab.

Descriptors: *Sewage effluents, *Irrigation effects, *Oak trees, *Specific gravity, *Growth rate, Deciduous trees, Wastes, Waste disposal, Water pollution sources, Waste water disposal, Fertilization, Forest management, Irrigation, Trees.

Increment cores at breast height were removed from 41 white oak (Quercus alba and Q. Stellata) and 51 red oak (Q. coccinea and Q. velutina) trees growing on 2.5 acres in southern Missouri which was sprinkler-irrigated with treated sewage effluent. Growth rate increased significantly for white oaks but not for red oaks while specific gravity increased only for the red oak group. White oak trees of the larger diameter classes responded more favorably to treatment than trees in the smaller diameter classes. Red oak response appeared to be independent of diameter class for specific gravity data. The difference in age between the red and white oaks may have been an important factor in observed treatment effects. (Swichtenberg-IPC)
W79-00425

THE FEASIBILITY OF USING FOREST LANDS FOR RECYCLING SLUDGE NUTRIENTS IN NORTHERN NEW ENGLAND,
New Hampshire Univ., Durham.
M. Koterba.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 067, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, May 1977. 88 p, 22 fig, 6 tab, 120 ref. OWRT A-039-NH(3), 14-31-0001-4029.

Descriptors: *Sludge disposal, Forest soils, Natural resources, Vegetation, Liquid waste, rates of application, Methods of application, *Recycling, Waste disposal, *New England, Ionic concentrations, Chemistry of soil water, Streams, Lysimeters, *New Hampshire.

Dewatered and limed sludge was obtained from a primary treatment plant and spread at two rates, 25 and 125 wet t/ha, on sandy loam soils in a northern hardwood forest in N.H. Changes in soil water chemistry were assessed using water samples collected at 20 and 45 cm depths with suction lysimeters. The 125 t/ha rate caused an increase in the concentration of most ions in soil water during the first two years following application. At the 20 cm depth, just below the organic horizons, Cl reached a mean maximum of 27.5 mg/l after sludge application compared to control values of less than 0.3 mg/l. SO4 eventually increased 8-9 mg/l soon after application. Mean Ca values rose to over 13.5 mg/l compared to background concentrations of about 2 mg/l. Mg, Na, K, H, and NO3 ions showed maximum increases in concentration that averaged 2 to 3 fold greater than their control values of less than 0.5 mg/l. NH4 and total P were unaffected by the sludge application. At the 45 cm depth, just above a fragipan, the increases in ionic concentrations following the 125 t/ha application of sludge were less than one-half the increases that occurred at 20 cm depth. Within one year after the sludge was spread, the concentrations of most ions were smilar in the treated and control plots. Soil water chemistry at the 45 cm depth was similar to stream water chemistry in the study area. The changes that occurred in soil water chemistry at this depth after applying sludge at the heavy rate could reflect potential changes in stream water chemistry. The temporary enrichment of soil water nutrients after sludge application had minimal impact on the frequency and diversity of native herbs and shrubs and on basal area growth of trees.
W79-00446

LEACHING CHARACTERISTICS OF VARIOUS HEAVY METALS, NON-HEAVY METALS AND ANIONS FROM MUNICIPAL SEWAGE SLUDGE ASH,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W79-00459

SIMPLE MODEL FOR OCEAN OUTFALL PLUMES,
General Dynamics Corp., Pomona, CA.
For primary bibliographic entry see Field 5B.
W79-00479

5F. Water Treatment and Quality Alteration

WATER FILTERING AND DISPENSING APPARATUS,
E. N. Martin.
U.S. Patent No. 4,086,166, 9 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1432-1433, April 25, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Filtration, Filters, Domestic water, Water conservation, Brines.

An improved water filtering, storing and dispensing apparatus is adapted to be connected with a pressurized municipal service water system to filter, purify, or upgrade the quality of the service system water, and store all of the filtered water produced for subsequent dispensing on demand. Waste water or brine which is the by-product of filtration is utilized as a motive fluid to act upon and effect pressure dispensing of stored filtered water. The apparatus operates to make and to store a limited predetermined volumetric supply of filtered water for dispensing and use, upon demand. It operates to consume service water and produce filtered water only when less than a full supply of filtered water is present and which shuts off automatically to stop all flow when a full supply of filtered water is present.
W79-00019

LOW MOLECULAR WEIGHT HYDROLYZED POLYACRYLAMIDE USED AS A SCALE INHIBITOR IN WATER SYSTEMS,
American Cyanamid Co., Stamford, CT. (Assignee).
D. S. Song, R. J. Duffy, C. R. Witschonke, A. M. Schiller, and M. A. Higgins.
U.S. Patent No 4,085,045, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1058, April 18, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, *Scaling, Chemical reactions, Hydrolysis, Corrosion control, Antiprecipitants.

A process for inhibiting scale formation uses a low molecular weight hydrolyzed polyacrylamide prepared by a process involving simultaneously and continuously charging separate streams of acrylamide monomer, ammonium persulfate (as catalyst) and mercaptoalkaonic acid (as chain transfer agent) to a reaction zone containing water under reflux. The rate of charging is such that the heat of polymerization is sufficient to maintain reflux in the reaction zone without exceeding the capacity of the condenser to remove the heat of reaction. Then the polymer product is reacted with sufficient aqueous caustic to hydrolyze from about 60 to 90% of the amide groups in the polymer product. (Sinha-OEIS)
W79-00027

TREATMENT OF WATER OR AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
A. Harris, J. Burrows, and T. I. Jones.
U.S. Patent No. 4,089,796, 5 p, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1031, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Demineralization, Scaling, Corrosion, Corrosion control, Additives, Zinc, Chemical reactions.

A process is provided for inhibiting the corrosion and scale forming tendencies of water or an aqueous system which comprises treating the water with from 0.1 to 500 ppm of an additive combination comprising from 2.5 to 80% by weight of zinc (calculated as Zn++) and from 97.5 to 20% by

eight of hydrolysed polymaleic anhydride, or of water soluble salt of such hydrolysed polymaleic nhydride. (Sinha-OEIS)
V79-00039

ATTERY OPERATED WATER PURIFICATION SYSTEM,
achs-Systemtechnik G.m.b.H., Schweinfurt West Germany).
V. Fischer, and B. Hengst.
J.S. Patent No. 4,089, 768, 9 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1024, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water urification, Water quality control, *Electrolysis, Electric currents, Direct current, Equipment, Waste water treatment, Portable equipment, Batteries.

The proper operation of an electrolytic cell for water purification requires an adequate current to e passed between electrodes of the cell and an dequate dwell time of the water in the cell. The urrent flow through the cell depends on the conuctivity of the raw water which is not predicable nd not capable of being controlled. With water ow in mineral content, the conductivity may be uite low and is not affected by organic contamiants. A water purification system which is self-ontained and portable, sufficiently flexible to perate on a wide variety of water sources, and imple to operate, yet capable of reliably disinfectng water carrying pathogenic microorganisms hus should be capable of supplying a relatively igh voltage. The weight of a battery is directly roportional to the outpout voltage, yet a portable vater purification unit should be as light as possile. To achieve its objects the invention provides a vater purification system including an electrolytic ell in which the dwell time of the water in the cell s maintained by a pump which supplies raw water nd causes purified water to be discharged at a ixed rate. The unit may employ a battery of relaively low output voltage and correspondingly low veight because a D.C. power supply circuit receivng energy from the battery furnishes a D.C. outut voltage exceeding the battery voltage to the lectrolytic cell. (Sinha-OEIS)
W79-00043

WATER DISTILLER WITH CONE SHAPED CONDENSER,
F. C. Kirschman, and W. B. Bolte.
U.S. Patent No. 4,089,750, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1019, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Distillation, Condensation, Equipment.

A water distiller arrangement provides for an efficient distillation process where the inlet water supply is controlled as a function of the temperature of the output of the distiller, and inlet water is preheated in an interior chamber surrounded by a passageway through which the water vapor passes after leaving the boiling chamber and while it condenses. The unit is quite compact because of the inclusion of the preheat chamber and condensing chamber in spaces that normally would be unoccupied in distillers where the chambers are stacked one on top of the other, and at the same time the construction is simplified and assembly time and costs reduced. (Sinha-OEIS)
W79-00045

APPARATUS FOR PRODUCING HIGH-PURITY WATER,
Department of Health, Education and Welfare, Washington, DC. (Assignee).
N. A. Karamian.
U.S. Patent No. 4,089,749, 9 p, 4 fig, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p1019, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Distillation, Condensation, Equipment, Toxins, Endotoxins.

In pharmaceutical work it is important that the water used for the preparation of parenteral solutions be free from endotoxins. The water used for this purpose is normally made by distillation. During distillation, the endotoxins in the feed water carry over by entrainment and contaminate the distillate. In order to prevent endotoxins and other impurities from entering the distilled water, the still must be designed to prevent creepage and entrainment. The water in a storage vessel must also be kept sterile and protected from chemical contamination. The apparatus of this invention includes a distillation flask, a carboy and a condenser unit, all of borosilicate glass. A respective filter is provided between the ambient atmosphere and the interiors of the flask, the carboy and the condenser unit to remove airborne bacteria and dust particles. In inlet valve is provided for feeding water into the flask, all water-contacting parts of this valve being of polytetrafluoroethylene. The open parts are interconnected with flexible, polytetrafluoroethylene tubing. A two-way, stopcock allows high-purity water to be removed from the carboy. (Sinha-OEIS)
W79-00046

AUTOMATIC SYSTEM CLEANER FOR REMOTE MONITOR,
For primary bibliographic entry see Field 5A.
W79-00051

EMPLOYING METHYLENE PHOSPHONATES OF OXYALKYLATED POLYALKYLENE POLYAMINES IN CHELATION AND/OR SCALE INHIBITION,
Petrolite Corp., St. Louis, MO. (Assignee).
P. M. Quinlan.
U.S. Patent No. 4,088,574, 8 p, 4 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 635, May 9, 1978.

Descriptors: *Patents, *Water treatment, *Scaling, Chemical reactions, *Chelation, Corrosion control.

Compounds used as scale inhibitors, chelating agents etc. consist of methylene phosphonates of oxyalkylated polyaklylene polyamines having at least three nitrogen atoms wherein there are nitrogen-bonded methylene phosphonate units of the formula -- CH2PO(OM)2. (Sinha-OEIS)
W79-00052

PROCESS FOR THE TREATMENT OF WATER SOLUTION BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee).
K. Marquardt.
U.S. Patent No. 4,088,563, 21 p, 12 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 632, May 9, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Desalination, *Water softening, Ion exchange, Resins, Equipment, Regeneration, Backwashing.

The treatment of water such as preparation, softening and/or desalinating is accomplished by ion exchange processes. In the quasi-continuous treatment, the ion exchange resins are conducted through a treatment container and a regenerating-and-washing-column. The ion-exchange resins leave the liquid treatment container through a bottom funnel, and before entering the regenerating-and-washing-column flow into a rinsing tank in which they are thoroughly re-rinsed at lease once during each entire cycle. The removal of the ion-exchange resins from the rinsing tank and from the regenerating-and-washing-column is by means of an immersion tube at the top of the regenerating-and-washing-column, the depth of immersion of the immersion tube being adjustable according to the volume in the bottom funnel of the treatment container. (Sinha-OEIS)
W79-00054

WATER HARDNESS AND CARDIOVASCULAR MORTALITY,
Ottawa Univ. (Ontario). Dept. of Epidemiology and Community Medicine.
For primary bibliographic entry see Field 5C.
W79-00171

WATER TREATMENT: IRON, BOILER WATER AND WATER ANALYSIS.
Ground Water Age, Vol. 13, No. 1, p 19-23, September, 1978. 2 fig.

Descriptors: *Water treatment, *Iron, *Manganese, *Chemical feed pumps, *Boilers, Water analysis, Water sampling, Corrosion, Scaing, Oxidation, Filtration, Bioassay.

Iron and manganese impart a metallic taste to water, cause stains on tableware, plumbing fixtures and laundry, and form sludge deposits in piping, pressure tanks, water heaters, etc. In small concentrations they can be removed with an ordinary softener. For medium concentrations an oxidizing filter is used which requires periodic regeneration with potassium permanganate. For high concentrations, chlorination with a chemical feed pump and filtering is required. Low-pressure boiler water treatment is especially important since scale or sludge reduce boiler efficiency and water flow and corrosion damages the heating system. Contaminants in boiler water come from three sources: (1) incoming feed water; (2) installation by-products; and (3) products of corrosion. The proper start-up procedure for boilers is outlined. This is the most important means of preventing trouble in boiler water. After start-up, boilers should undergo periodic oil emulsification, rust prevention, scale elimination and foaming control to maintain the water in proper condition. Small leaks can be plugged with 'stop leaks.' For drinking water, periodic bio-analyses are strongly recommended. The proper procedure for water sampling is outlined and several sample analyses, indicating different water problems and treatment solutions, are discussed. (Purdin-NWWA)
W79-00176

WHAT'S IN THE WATER, A LOOK AT THE PROPOSED EPA REGULATIONS FOR ORGANIC CHEMICALS IN PUBLIC WATER SUPPLIES,
M. R. Richard.
Water Well Journal, Vol. 32, No. 10, p 68-71, October, 1978.

Descriptors: *Water treatment, *Activated carbon, *Organic wastes, *Water pollution control, Municipal water, Regulation, Carcinogens

The U. S. Environmental Protection Agency, after finding organic chemicals in the drinking water supplies of many cities, has proposed regulations for the removal of organics by treatment with granular activated Carlon (GAC). Recent studies suggest that organics cause cancer at high dosage levels, but whether they are carcinogenic in trace quantities is questionable. Techniques to identify organics vary widely and lack precision. Thus, it is difficult to tell whether GAC can remove a substantial percentage of organics. GAC itself may contain carcinogenic substances or become a medium for bacteria, molds and algae, all of which could add toxic substances to the water. Since GAC has never been used in the U. S. for organics, the EPA and water systems managers disagree concerning the regeneration frequency and cost of carbon beds. More research is needed to test GAC and other techniques for organics control, such as adsorption, disinfection, resin beds and aeration.

It is hoped that effective, practical alternatives to the proposed regulations can be developed.
W79-00179

ON THE VERTICAL DISTRIBUTION AND SEASONAL DEVELOPMENT OF THE DENSITY OF DREISSENA POLYMORPHA LARVAE IN THE PELAGIC ZONE OF THE LAKE OF ZURICH (IN GERMAN),
Gesundheitsinspektorat Stadt Zurich, (Switzerland).
P. Suter-Weider, and U. Zimmermann.
Schweiz Z Hydrol 38(2), p 159-170, 1976.

Descriptors: Lakes, *Lake of Zurich, *Mussels, Larvae, Water pollution control, Water treatment.

The freshwater mussel D. polymorpha Pallas was sighted for the 1st time in Lake Zurich about 1969. This indicated a problem for the treatment of the lake water. By means of a pump and vertical net hauls more information was added to that existing on Lake Zurich. Additional dates about temperature, depth of Secchi disk visibility and beam transmittance were collected. The larvae of D. polymorpha appeared at the beginning of June. Following the mean temperature of the epilimmion the number of individuals/m2 reached a maximum of 210,000. The greatest concentration of larvae measured in 1974 was 54,375/m3 at a depth of 4 m. The last appearance of D. polymorpha was observed at the end of Oct.--Copyright 1978, Biological Abstracts, Inc.
W79-00280

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5D.
W79-00306

WATER -- 1977.
American Inst. of Chemical Engineers, New York.
For primary bibliographic entry see Field 5D.
W79-00342

ON-SITE GENERATION OF HYPOCHLORITE SOLUTIONS BY ELECTROLYSIS OF SEAWATER,
Diamond Shamrock Corp., Painesville, OH.
J. E. Bennett.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9617-0178 ($0.95). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 265-269, 1978, 4 fig, 13 ref.

Descriptors: *Sea water, *Electrolysis, *Chlorides, Hypochlorite, *Disinfectant, Waste water treatment, Chlorine, Hydrogen, Anodes, Electrochemistry, Electrodes, Salinity, Municipal wastes, Industrial wastes.

Electrolysis of sea water was evaluated as a method of on-site generation of hypochlorite and found to be a feasible alternative to using chlorine or purchased hypochlorite as a disinfectant. Laboratory testing was followed by studies using large, production-size cells capable of producing 1200 lb of available chlorine a day using four 300-lb cells in hydraulic series. These cells were built of polyvinyl chloride to protect against the corrosive action of hypochlorite, and acrylic covers were used for better visibility. Chlorine is generated at the anode according to the reaction, 2Cl(-) = Cl2 = 2e(-). Chlorine immediately undergoes hydrolysis to hypochlorite, Cl2 = H2O = HClO + Cl(-) + H(+). Of course, other competing reactions do take place but their effects can be minimized by proper cell design, choice of electrode materials, and choice of operating parameters. Sea water containing 50% to 100% average salinity can be electrolyzed to produce hypochlorite solutions of 1 - 4 g/l available chlorine. AC power consumption ranges from 1.5 to 2.9 kwh per pound of chlorine depending on temperature and salinity of the sea water. The process also produces 5.8 cu ft of hydrogen per pound of available chlorine according to the equations: HClO = ClO(-) + H(+) and 2H(+) + 2e(-) = H2. Hydrogen must be disengaged from the hypochlorite stream before use, to prevent explosion hazards. It can be burned for fuel or vented to the atmosphere. (See also W79-00342) (Majtenyi-IPA)
W79-00372

RURAL WATER SUPPLIES FROM LATERITE RUNOFF,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
N. Egbuniwe.
Water Resources Bulletin, Vol. 14, No. 2, April 1978, p 466-469. 1 fig, 3 tab, 4 ref.

Descriptors: *Water supply, *Runoff, *Laterites, *Nigeria, Rural areas, Sedimentation, Dry season, Floccualtion, Wood ash, Clear water, Turbudity, Coliform count, Plate count, *Water treatment, Water quality.

Villagers living around Nsukka in Eastern Nigeria derive their water supplied during the dry season by subjecting the runoff from laterite soils to five months' sedimentation. This study found that by flocculating the runoff with wood ash at a dose of 5 g/l, clear water--with turbidity of less than 5 JTU, Fe of less than 1 mg/l, Coliform count zero MPN, and Plate count of less than 5 colonies--was achieved after three days sedimentation. (Bell-Cornell)
W79-00387

STUDIES OF ION EXCHANGE AND CHELATION COMPOUNDS ADSORBED ON GRANULAR GRAPHITE,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W79-00431

CONTINUOUS ELECTROCHEMICAL SYNTHESIS USING A PACKED GRANULAR ELECTRODE,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W79-00432

5G. Water Quality Control

ECOLOGICAL SYSTEM AND METHOD,
R. E. Burton.
U.S. Patent No. 4,086,161, 10 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1430-1431, April 25, 1978.

Descriptors: *Patents, *Water quality control, Eutrophication, Ecology, Bodies of water, Biological communities, Aquatic algae, Balance of Nature, Bark.

An ecological system and method for counteracting the effects of excessive nutrient deposition (eutrophication) in bodies of water such as marshlands, inland ponds and lakes makes use of clusters of substantially individualized bark fibers positioned in upper, relatively oxygen-rich zones of such bodies of water. The bark clusters function to attract and hold excessive nutrient deposition in the form of colloidal wastes (e.g., colloidal solids of various types, single cell bacteria, etc.) and aquatic algae produced, while at the same time providing a safe habitat for algae predators and feeders in the form of minute animal organisms (e.g., crustacea, rotifers, snails, zooplankton, etc). The isolation and dispersion of the bark fiber clusters on the surface of the threatened bodies of water serves to prevent a disruptive imbalance between the algae and algal feeders by providing increased areas for life and surface breeding of various types of algae predators to thereby maintain essential trophic balance. (Sinha-OEIS)
W79-00021

SKIMMING APPARATUS,
N. J. R. Hartwick, and D. C. C. Lathe.
U.S. Patent No 4,085,049, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1059, April 18, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Oil pollution, Skimming, Water quality control, Equipment.

A device for removing oil and like products from the surface of water comprises at least a pair of spaced float members with an interconnecting shaft and a elongated, open sided reservoir having a weir edge. The cylinder reservoir is mounted on the shaft for free rotation. The central longitudinal axis of the reservoir is offset to the rear with respect to the axis of the shaft so that flotation of the reservoir lowers the front weir edge to allow fluid to enter the reservoir over the weir. Removal of skimmed fluid from the reservoir controls the depth of skim. (Sinha-OEIS)
W79-00025

SOLID-FLUID CONTACTING PROCESS,
Ashi Kasei Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
T. Misumi, T. Miyaji, and M. Kasai.
U.S. Patent No 4,085,042, 6 p, 2 fig, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1057, April 18, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, Adsorption, Resins, *Solids contact process, Ion exchange, Countercurrent flow, Regeneration.

A fixed-bed solid-fluid contacting process is provided comprising passing a fluid to be treated through a treatment zone packed with solid particles in one direction, regenerating the solid particles on depletion in activity by passing a fluid for activation in a direction opposite to the flowing direction of the fluid to be treated, washing the solid particles of contamination by extracting a portion of the solid particles simultaneously with the passing of the fluid to be treated through an outlet arranged in a position opposite to the flowing direction of the fluid to be treated to transport into a washing zone which is furnished separately from the treatment zone and recycling the washed solid particles into the treatment zone. The process is improved in the time cycle of treatment which is shortened and the pressure loss which is decreased. The process is also free from disturbance of bed and excellent in treatment efficiency. Typical example of application is ion exchange reaction. (Sinha-OEIS)
W79-00029

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, IL. (Assignee).
A. G. Clem.
U.S. Patent No. 4,084,382, 4 p, 5 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 836, April 18, 1978.

Descriptors: *Patents, *Soil sealants, *Seepage, *Industrial wastes, Waste water disposal, Bentonite, Expansive soils, Containment.

A method is disclosed for containing water having a high concentration of water-soluble industrial waste which, when in contact with bentonite, disintegrates the bentonite thereby allowing seepage of water through the soil. A soil sealant composi-

ion consisting essentially of bentonite, a water-soluble dispersing agent, and a water-soluble polymer is mixed with the soil. The water-soluble polymer is selected from the group consisting of polyacrlylic acid, water-soluble salts of polyacrylic acid, hydrolyzed polyacrylonitrile, polyvinyl acetate, polyvinyl alcohol, copolymers of the foregoing, and a copolymer of acrylic acid and maleic anhydride. The amount of water-soluble polymer is from 0.1 to 3.0% by weight, and the amount of water-soluble dispersent is from 0.1 to 3.0% by weight. The weight ratio of water-soluble dispersant to water-soluble polymer is from 6.1 - 36%. The soil sealant composition when mixed with soil forms a water-containing enclosure. (Sinha-OEIS)
W79-00034

OIL FENCE,
A.B. Sjuntorp (Sweden). (Assignee).
R. G. Hallhagen.
U.S. Patent No. 4,084,380, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 835, April 18, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Barriers, Floating, Oil fences, Containment.

An oil fence is especially adapted for defining of impurities on a water surface and is made of a web of cloth shaped material exhibiting alternating connected portions and multiple layer portions made in such a manner that pockets and/or channels are formed to receive float bodies for the support of the oil fence in water, and sinking weights in order to give the oil fence the intended upright position in the water. The cloth shaped web is comprised of an impregnated and/or coated textile material which is woven. The single layer portions are shaped from the interwoven weft of the converging layers of the adjacent multiple layer portions, thereby obtaining an extremely strong connection. (Sinha-OEIS)
W79-00036

BELT TYPE OIL REMOVAL UNIT,
Tenco Hydro/Aerosciences, Inc., Countryside, IL. (Assignee).
G. A. Ettelt, and A. L. Cohen.
U.S. Patent No. 4,089,784, 4 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 970, No. 3, p 1028, May 16, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water pollution control, Skimming, Equipment, Separation techniques, Rotary drums, Endless belts.

A system is provided for removing accumulated oil from a basin. An endless belt for carrying oil is partially submerged in the basin and is driven and supported by a rotary drum. The rotary drum has an irregular surface for frictional cooperation with the belt and a spring-biased roller urges the belt against the irregular surface. The oil scraping means comprises an oil wiper on the downstream side of the drum and the system further includes means for wiping the underside of the drum surface.
W79-00040

WATER DISTILLER WITH CONE SHAPED CONDENSER,
For primary bibliographic entry see Field 5F.
W79-00045

APPARATUS FOR DEPLOYING AND TAKING UP AN OIL FENCE,
Mitsubishi Electric Mfg. Co. Ltd., Amagasaki (Japan).
T. Kinase, I. Yano, K. Okubo, H. Kitakoga, and H. Tayama.
U.S. Patent No. 4,089,178, 10 p, 19 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 833, May 16, 1978.

Descriptors: *Patents, *Oil spills, *Water pollution control, Water quality control, Barriers, Equipment, Floating, Oil fences, Containment, Deployment.

An apparatus for deploying and taking up an oil fence for housing and spreading it in a simple manner with a high efficiency comprises, in combination, a floating framework having side walls defining a substantially enclosed receiving space in which an oil fence is to be stored with its width vertical. One side of the framework is partly cut away to provide an opening into the receiving space. A guide comprised of rollers is placed at the opening with the axes of the rollers vertical to that the width of the oil fence is always vertical. (Sinha-OEIS)
W79-00048

PROCESS AND APPARATUS FOR SEPARATING OIL FROM WATER CONTAMINATED WITH OIL,
Fujisash Industries, Ltd., Kawasaki (Japan). (Assignee).
T. Yoshioka, and S. Iwanami.
U.S. Patent No. 4,088,578, 12 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 637, May 9, 1978.

Descriptors: *Patents, *Water pollution treatment, Water quality control, *Oil pollution, Separation techniquesm Specific gravity, Equipment, Bilge water.

Water contaminated with oil, such as bilge water, is pumped into a closed vessel. Separation of the oil and water is accomplished due to the floating of oil on the water because of their different specific gravities. The separated oil is sucked through a conduit to discharge the separated oil and reduce the pressure of the liquid phases. The purified water is discharged through a conduit provided with a non-return valve. The purified water is forced to flow through the conduit by the pressure of a stream of bilge water which flows into the container. (Sinha-OEIS)
W79-00050

METHOD FOR DEPOLLUTING FRESH AND SEA WATER FROM PETROLEUM PRODUCTS,
Snam Progetti S.p.A., Milan (Italy).
W. Marconi, R. Olivieri, L. Degen, and A. Robertiello.
U.S. Patent No. 4,087,356, 6 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Water pollution control, Water quality control, *Oil pollution, Biodegradation, *Microbial degradation, Nitrogen compounds, Microorganisms, Dispersion, Freeze-dried hydrocarbon-oxidizing microorganisms.

Microorganism cultures used for oxidizing the hydrocarbons are integrated by lipophilic and floating compounds which contain slow-release nitrogen in a form which can be assimilated by such microorganisms. Ureidic derivatives of higher aldehydes are the preferred compounds. Inert supports can be used, if necessary, and still better results are achieved when using also nonionic dispersants and freeze-dried hydrocarbon-oxidizing microorganisms. The substances can be stored for indefinitely long times, do not belong to the category of toxic products, can easily be shipped to the place of their use, and can easily be spread over the polluted surfaces. The used nutrients accelerate a natural biological degradation process of the pollutants without disturbing the ecological equilibrium. On completion of the use no more residues are left and, in the case of porous bodies, the residues are nothing but minerals which already exist in the natural environment. (Sinha-OEIS)
W79-00058

ADAPTATIONS AND RESISTANCE TO ANOXIA IN CLOEON DIPTERUM (EPHEMEROPTERA) AND NEMOURA CINEREA (PLECOPTERA),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
B. Nagell, and T. Fagerstrom.
Oikos, Vol. 30, p 95-99, 1978. 7 fig, 1 tab, 10 ref.

Descriptors: *Mayflies, *Stoneflies, *Oxygen requirements, *Water temperature, Insects, Insect behavior, Adaptation, Habitats, Mortality, Larval growth stage, Ponds, Seasonal, *Acclimation.

The survival of larvae of Cleon dipterum and Nemoura cinerea was studied after exposure to anoxia for 40 h at temperatures between 0C and 11.5C. If the larvae were acclimated to 2C for 6 wk C. dipterum survived temperatures close to 0C better than N. cinerea. If they were acclimated to 10C, most C. dipterum died at all experimental temperatures. N. cinerea died to 60% at 5C; at higher or lower temperatures the mortality increased. A 6-d stay in 2C of C. dipterum previously acclimated to 10C was not long enough to induce resistance to anoxia. When exposed to anoxia N. cinerea became unconscious within 10 min. whereas larvae of C. dipterum did so first within 60 min. It is concluded that a long term acclimaton to low temperatures induces in C. dipterum but not in N. cinerea a high degree of resistance to anoxia at temperatures close to 0C. This resistance is of great importance for C. dipterum since in cold temperated regions this species usually overwinters in anoxia conditions. The different rate at which the species lose consciousness in in anoxia may be important for their survival in natural habitats. (EIS-Deal)
W79-00076

ENVIRONMENTAL MANAGEMENT STRATEGY FOR THE GREAT LAKES SYSTEM.
International Reference Group on Great Lakes Pollution from Land Use Activities.
July, 1978. 134 p, 15 fig, 24 tab, 95 ref, 4 append.

Descriptors: *Great Lakes, *Environmental control, *Water quality, *Land drainage, *Sediment, *Water pollution sources, Pollution, Phosphorus, Mercury, Bacteria, Erosion, Lead, Pesticides, Polychlorinated biphenyls, Eutrophication, Lake Erie, Lake Huron, Lake Ontario, Lake Michigan, Lake Superior, Tributaries, Organic compounds, Microorganisms, Trace elements, Nitrogen, Chlorides, Asbestos, Viruses, Land use, Watersheds(Basins), International commissions.

Results are presented of a study of pollution of the boundary waters of the Great Lakes system by land drainage (including ground and surface runoff and sediment) from agriculture, forestry, urban and industrial land development, recreational and parkland development, utility and transportation systems, and natural sources. Land drainage is the source of pollutants such as phosphorus, bacteria, polychlorinated biphenyls, pesticides, industrial organic chemicals, mercury, and lead. Each pollutant is discussed in terms of background, sources, concentrations, and control recommendations. Factors involved in production of pollutants, such as land characteristics, land use intensity, materials usage, and meteorology of the region are described. Management strategy for the Great Lakes ecosystem is outlined and recommendations are made which stress site-specific approaches to reduce loadings of pollutants. The study resulted in new knowledge of the relationships between nonpoint source pollution and land use activities in the many watersheds draining to the Great Lakes, the impact of these land use activities upon quality of the receiving waters, the pollutants transported by tributaries, and the impact of the pollutants on the lakes themselves.

Statistics on pollutant concentrations in specific areas, land use activities, and estimates of total pollutant concentrations in sediments, are provided. (Majtenyi-IPA)
W79-00084

RESEARCH TO ANTICIPATE ENVIRONMENTAL IMPACTS OF CHANGING RESOURCE USAGE.
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 6G.
W79-00085

OUR RECLAMATION FUTURE: THE MISSING BET ON TREES,
Southern Illinois Univ. at Carbondale, IL. Dept. of Botany.
For primary bibliographic entry see Field 4C.
W79-00086

REJECT STREAM REPLACEMENT STUDY.
Bureau of Reclamation, Denver, CO. Lower Colorado Region.
For primary bibliographic entry see Field 3A.
W79-00092

SOIL, WATER AND AIR SCIENCES RESEARCH.
Science and Education Administration, Washington, DC.
For primary bibliographic entry see Field 2G.
W79-00105

INFLUENCE OF STRIP MINES ON REGIONAL GROUND-WATER FLOW,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
J. L. Wilson, and D. A. Hamilton.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 13988, p 1213-1223, September 1978. 7 fig, 12 ref, 2 append.

Descriptors: *Strip mines, *Base flow, *Groundwater, *Great Plains, *Model studies, Aquifers, Water sources, Water resources, Coal mines, Dewatering, Excavation, Analytical techniques, Finite element analysis, Mathematical models, Numerical analysis, Flow, Groundwater movement, Phreatic lines, Water table.

The effect of an operational strip mine on regional groundwater flow was investigated using a finite element model of the steady flow system. Mine location, mine size, water table configuration, and subsurface layering of aquifer units were examined. The results demonstrated that: (1) The impact of a mine can extend far beyond its radius of influence at the water table; (2) mines placed near regional discharge areas have a more significant effect on the regional system; (3) natural water-table variation due to topography masks the effects of some mines; and (4) buried aquifers beneath the mine excavation limit the amount of flow field distortion caused by the mine. (Humphreys-ISWS)
W79-00118

PRELIMINARY IDENTIFICATION OF THE SALT PICK-UP AND TRANSPORT PROCESSES IN THE PRICE RIVER BASIN, UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3C.
W79-00145

SEA-WATER NEUTRALIZATION OF EFFLUENTS FROM THE INDUSTRIAL PROCESSING OF PHOSPHORITE. A CASE STUDY IN THE PRACTICAL USE OF BASIC KNOWLEDGE IN ANALYTICAL AND MARINE CHEMISTRY,
Chalmers Univ. of Technology, Gotborg (Sweden); and Goteborg Univ. (Sweden). Institutionen for Analytisk Kemi.
D. Dyrssen, and B. Elgquist.
Analytica Chimica Acta, Vol. 100, p 23-29, 1978. 3 fig, 3 tab, 17 ref.

Descriptors: *Fluorides, *Silicon, *Chemical wastes, *Neutralization, *Waste dilution, Sea water, Computer programs, Analhytical techniques, Graphical analysis, Volumetric analysis, Chemical reactions, Chemical properties, Solubility, Phosphorus compounds, Waste water treatment, Byproducts, Industrial wastes.

The HALTAFALL computer program identified the reactions occuring during the neutralization and dilution with sea water of silicon tetrafluoride (SiF4) and hexafluorosilicic acid (H2SiF6); these compounds are byproducts of superphosphate, phosphoric acid, and phosphate production. Previously derived equilibium constants for the complexation of magnesium and calcium with fluoride, acidity constants for carbonate ions in sea water, and disproportionation equilibria for soluble silicon species were selected for the HALTAFALL calculation. The program was applied to a case in which 270 kg/hr of fluoride as SiF4 were removed with 240 cu m/hr of sea water in a scrubber; 140 kg/hr of F as fluorosilicic acid were added to the effluent and diluted with sea water. Measurements on the sea water included: salinity (18.82 ppt), total alkalinity (0.00195 moles), total calcium (0.0060 moles), total magnesium (0.029 moles) and total fluoride (0.00004 moles). The effluent contained 0.0592 moles of fluoride in the form of SiF4, and 0.0307 moles as H2SiF6. Calculated pH curves indicated that neutralization was achieved at a dilution of 1:40-50; the concentrations of silicon complexes decreased rapidly as dilution approached the equivalence value. If the solubility product of calcium and fluoride was greater than the ionic strength of the brackish water, precipitation occurred unless the solution was rapidly diluted from 1:25 to 1:200. Predictions by the HALTAFALL program were verified by titration experiments with sea water and the industrial waste stream. (Lisk-FIRL)
W79-00151

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART 2,
American Cyanamid Co., Stamford, CT.
R. B. Tabakin, R. Trattner, and P. N. Cheremisinoff.
Water and Sewage Works, Vol. 125, No. 8, p 72-75, August, 1978. 3 fig, 31 ref.

Descriptors: Oily water, *Emulsions, *Oil wastes, *Separation techniques, *Flotation, Centrifugation, Acidity, Coagulation, Salts, Coalescence, Drops(Fluids), Filters, Activated sludge, Trickling filters, Fibrous beds, Carbon filters, Membrane processes, Reverse osmosis, Dispersion, Waste water treatment, Industrial wastes.

Processes and equipment are evaluated for the separation of oil and water from oil refinery effluents. Air flotation can reduce the effluent oil content to 1-20 ppm. In general, air is dissolved in the effluent at 2-3 atm; the pressure is released; and bubbles are formed. Variations of this process include: full-flow operation, in which the entire influent flow is air saturated; split-flow operation, where part of the flow is pressurized and aerated and the rest is diverted directly to the flotation chamber; and recycle operation, in which influent is mixed with re-pressurized, dissolved air-bearing clarified effluent. Centrifugal separators, removing oil in a small column at the vortex, have been found more efficient in separating water-in-oil emulsions, oil-wet solids, and dispersed oil. Of the chemical, physical, and electrical emulsion breaking techniques, chemical treatment is most common. Methods of chemical separation include acidification, coagulation, salting out, and demulgation with organic demulsifiers; jar testing of demulsifiers is recommended to determine optimum conditions. Coalescence, utilizing fibrous filter media such as nylon, propylene, or fiberglass wrapped around a rigid spool, operates on the principle of gravity settling of large droplets formed from smaller droplets. Biological treatment by trickling filters or activated sludge is only effective for low oil concentrations. Large capital investiments have been associated with carbon adsorption and membrane filtration techniques. (Lisk-FIRL)
W79-00158

OIL-TROUBLED WATER,
American Ground Water Consultants, Albuquerque, NM.
For primary bibliographic entry see Field 5B.
W79-00169

NO WATER-SOURCE DAMAGE FOUND IN OIL STATES.
The Oil and Gas Journal, Vol. 76, No. 35, p 52, August 28, 1978.

Descriptors: *Oil pollution, *Water pollution control, *Saline water intrusion, Aquifers, Interstate commissions, Chlorides, Correlation analysis, Well regulations.

The Interstate Oil Compact Commission (IOCC) sponsored a study of ground-water contamination by oil and gas operations in five big producing states: Texas, New Mexico, Oklahoma, Louisiana, and Arkansas. The study utilized over 450 monitoring points in major aquifers overlying oil and gas producing reservoirs and covered a 15 year record of well water tests. In four of the states, chloride concentration in the water was monitored and was not found to increase. In Texas, four approaches were made involving the statistical relationship between chloride concentration in ground water and oil production; chloride variation in public water supplies near oil and gas fields, salinity contours for different time periods, and a review of related literature and research. The study concluded that no significant relationship exists between chloride increases in groundwater and oil and gas production, and that regional changes in groundwater quality are associated with natural causes. (Purdin-NWWA)
W79-00172

WHAT'S IN THE WATER, A LOOK AT THE PROPOSED EPA REGULATIONS FOR ORGANIC CHEMICALS IN PUBLIC WATER SUPPLIES,
For primary bibliographic entry see Field 5F.
W79-00179

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURISM. 1. CHEMISM OF THE RYBI POTOK WATERS AND THE CHLOROPHYLL CONTENT IN ATTACHED ALGAE AND SESTON IN RELATION TO THE POLLUTION,
Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.
For primary bibliographic entry see Field 5C.
W79-00218

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.
Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Management.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 180, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/5-78-007, May 1978. 27 p, 2 fig, 4 ref, 4 append. S-801000.

Descriptors: *Water quality, *Water quality control, *Water resources, *Information retrieval, Data collections, *Pennsylvania, Water resources research, Data processing, Information exchange, Water resources development, Interstate, Groundwater, Surface water, Administration, Water pollution control.

To provide systems which would enhance the speed and precision of decision making in the field of water quality management, the State of Pennsylvania initiated a program of information handling known as WAMIS, or State Water Quality Management Information System. The objectives of the first grant period, beginning January 1, 1969, were to enhance and demonstrate this system which could be made available for use by Federal, other State, and inter-State water pollution control agencies, and to provide a base for a Water Quality Management Data Systems techniques training program for Federal, State, and inter-State water quality management personnel. Part of the proposed system was implemented using standard keypunch card data entry for processing on a UNIVAC (RCA) SPECTRA 70/45 and provided predetermined periodic reporting capability. This portion of the system was reported in EPA publication 600/5-74-022 entitled, 'Demonstration of a State Water Quality Management Information System.' Since then, systems concepts, systems design techniques, software and telecommunications capability have experienced marked changes which are reported. Some of the areas of water quality management covered by the WAMIS system are: facility inspections; progress in terms of enforcement, construction, and water quality upgrading; permit processing; identification of problem areas and priorities; determination of specific treatment, research, and budgetary needs; treatment plant operations; treatment plant operator certification; word processing; ground- and surface water quality; and planning. (See also W77-04021) (Majtenyi-IPA)
W79-00222

REMOTE MONITORING OF COAL STRIP MINE REHABILITATION,
National Aeronautics and Space Administration, Slidell, LA. Earth Resources Lab.
J. E. Anderson, and C. E. Tanner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 647, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-78-149, July 1978. 58 p, 17 fig, 11 tab, 18 ref, 3 append. 68-03-2636.

Descriptors: *Remote sensing, *Aerial photography, *Surveying instruments, *Mapping, *Land reclamation, *Strip mines, *Inter-agency cooperation, Coal mines, Vegetative cover, Water resources, Landsat, Multispectral scanner, Data processing, Data storage and retrieval, Land reclamation, Revegetation.

A cooperative project is being carried out by the Environmental Protection Agency (EPA) and the National Aeronautics and Space Administration (NASA) to share both hardware and software technology for processing remotely sensed digital data obtained from aircraft or satellites. The project is divided into three phases, the first of which is reported here. During this phase the state-of-the-art technology for processing aircraft-acquired multispectral scanner (MSS) data was transferred to the Environmental Monitoring and Support Laboratory in Las Vegas, NV. (EMSL-LV). Also, Landsat and aircraft multispectral scanner data and photographic data over coal strip mines in the Western United States were analyzed using basic pattern recognition techniques refined and/or developed at the NASA Earth Resources Laboratory, Slidell, LA (NASA/ERL). The results of the interpretation of aerial photography and the processed aircraft scanner data were compared to identify apparent weak areas in either approach. The chi square test demonstrated that there were no significant differences between results obtained using computer-implemented techniques and those using conventional aerial photo-interpretation techniques. Phase II of the project will involve monitoring selected coal strip mines in the West by EMSL-LV and continued research on pattern recognition techniques by ERL. Phase III will include tests of the system in an operational mode by EMSL-LV with continued software development from NASA/ERL. (Majtenyi-IPA)
W79-00226

ON THE ENVIRONMENTAL EFFICIENCY OF ECONOMIC SYSTEMS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6G.
W79-00230

CONCEPTUAL AND STATISTICAL ISSUES IN DEVELOPING ENVIRONMENTAL MEASURES - RECENT U.S. EXPERIENCE,
Bureau of Economic Analysis, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-00232

WET COOLING TOWER BACKFITTING ECONOMICS,
Iowa Univ., Iowa City. Div. of Energy Engineering; and Iowa Univ., Iowa City. Div. of Research Engineering.
T. E. Croley, II, A. R. Giaquinta, and V. C. Patel.
Journal of Power Division, Vol 104, No 2, p 115-130, April 1978. 9 fig, 7 fig. EPA 68-02-0430, USDA 14-31-0001-9015, 14-31-0001-5201.

Descriptors: *Economics, *Analytical techniques, *Cooling towers, *Closed-cycle cooling, *Costs, *Powerplants, Methodology, Computer programs, Open-cycle cooling, Equipment, Federal Water Pollution Control Act Amendments of 1972, Operation and maintenance, Backfitting.

A technique is presented for evaluating the cost of backfitting a power plant or unit currently using open-cycle cooling with a closed-cycle mechanical-draft crossflow wet cooling tower. Many existing steam-electric plants with open-cycle cooling will be required by provisions of the Federal Water Pollution control Act Amendments of 1972 to backfit a closed-cycle system. Major economic factors are: (1) installation cost; (2) additional equipment and design changes in existing equipment; (3) plant downtime for changeover; (4) provision of additional generating capacity to replace power consumed by the closed-cycle system; (5) operation and maintenance costs of cooling towers; (6) operation cost of replacement capacity; and (7) additional cost of power generation due to decrease in plant efficiency. Basic assumptions, equations, and background data are presented, and components of capital and operating costs are described. Differential capital and operating costs are combined by the levelized annual cost method to obtain the unit excess costs of energy production resulting from backfitting. The technique is illustrated with a specific unit operating at constant full load, for which cost figures and normalized curves showing the dependence of maximum capacity loss, excess fuel consumption, and evaporative water loss on tower size are given. An analytical computer program is described. (Lynch-Wisconsin)
W79-00233

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER,
Department of Justice, Washington, DC. Antitrust Div.
For primary bibliographic entry see Field 6B.
W79-00234

A SOCIO-ECONOMIC APPROACH TO WATER POLLUTION LAW ENFORCEMENT IN ENGLAND AND WALES,
Newcastle-upon-Tyne Univ. (England). Dept. of Economics.
D. J. Storey.
International Journal of Social Economics, Vol. 4, No. 3, 1977, p 207-224. 6 tab, 20 ref.

Descriptors: *United Kingdom, *Effluents, *Water pollution control, *Law enforcement, *Pollution taxes(Charges), *Water quality standards, *Regulation, England, Wales, Litigation, Rivers, Costs, Legal aspects, Air pollution, Oil pollution, Economics, Social aspects, Equations, Economic analysis.

The present consent system in the United Kingdom for controlling direct effluent discharges into rivers is compared to an effluent pricing system, from the standpoint of law enforcement. It is concluded that it is not possible to determine the relative success of the two policies, because of difficulties in assessing the amount of compliance now achieved through 'arm-twisting'--that is, threats of litigation--by river authorities and the Alkali Inspectorate. Current enforcement policy is based on cooperation rather than confrontation, with litigation resorted to only after other methods have failed. Empirical data indicate that if firms minimize costs, a barely positive tax level will result in limitation of discharges at the plant level to a quantity about equivalent to those under the conciliatory approach, assuming litigation to be the only enforcement mechanism. Including arm-twisting in the evaluation, however, makes judgment difficult. It appears, nevertheless, that few of Stigler's law enforcement agency rule s are followed by environmental agencies in England and Wales; any proposals for establishing a unified inspectorate should be tested against these rules. The system of law enforcement prior to 1974 is outlined, and a comparison is made between enforcement methods for breaches of air and water pollution, and illegal discharges of oil. (Lynch-Wisconsin)
W79-00245

ECONOMIC ANALYSIS OF SELECTED FEATURES OF MUNICIPAL WASTEWATER CONSTRUCTION GRANT LEGISLATION,
Environmental Research Center, Research Triange Park, NC.
M. Rose, and J. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 619, Price codes: A07 in paper copy, A01 in microfiche. Publication No. EPA-600/5-77-011b, August 1977. 137 p, 11 tab, 6 ref.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Federal Construction Grant Program, *Treatment facilities, *Construction costs, *Economic efficiency, *Subsidies, Equity, Economics, Grants, Waste water treatment, Municipal wastes, Cost-sharing, Incentives, Resource allocation, Water pollution control, Legislation, Use rates, Cost-benefit analysis.

The Federal Construction Grant Program for subsidizing construction of municipal wastewater treatment facilities is evaluated, concentrating on three major aspects: (1) grant formula, (2) allotment funding process, and (3) industrial cost recovery. Existing legal provisions are shown to be ineffective in encouraging cost-effectiveness and in promoting equitable distribution of federal grant funds. Recommended improvements: (1) Provide higher cost-sharing rates and larger funding authorizations for secondary and higher-level treatment projects. (2) Supplement the grant program with a subsidy based either on operation and maintenance or on degree of abatement achieved to compensate for the absence of effluent charges. (3) Divide grant allotments into two portions, one based on cost-effectiveness of the project, and

one based on equity in which a community's pollution control costs are related to fiscal capability. (4) Return cost-recovery funds to the U.S. Treasury or Construction Grant Program for redistribution to highest priority projects, or at a minimum eliminate the local discretionary fund which currently can be used to finance projects unrelated to pollution control. The current grant program favors higher cost projects because it subsidizes only grant-eligible construction costs, and because of cost-recovery provisions relating to industrial use of public facilities. (Lynch-Wisconsin)
W79-00246

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED TREATMENT FACILITIES, 1974 'NEEDS' SURVEY, FINAL REPORT TO THE CONGRESS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 682, Price codes: A03 in paper copy, A01 in microfiche. February 1975. 24 p, 4 tab, 2 append.

Descriptors: *Construction costs, *Estimated costs, *Treatment facilities, *Waste water treatment, *Federal Water Pollution Control Act Amendments of 1972, Costs, Sewage treatment, Grants, Subsidies, Surveys, U.S. Environmental Protection Agency, Economics, Forecasting, Storm water.

A 1974 state-by-state cost estimate survey for wastewater treatment facilities was conducted by the U.S. Environmental Protection Agency in compliance with the Federal Water Pollution Control Act Amendments of 1972 as further amended by PL 93-243. Estimates obtained were for meeting 1983 water quality goals, and are intended as a possible basis for allocation of construction grant funds authorized after 1975. This final report presents cost estimates both as originally received and as corrected to eliminate clerical reporting errors. In addition, EPA adjustments are given based on evaluation of technical validity of cost estimates and identification of data anomalies that would treat some states unfairly if the estimates were used in a grant allocation formula. Cost categories with EPA-adjusted figures are: (1) secondary treatment, $12.6 billion; (2) facilities required by more-stringent water quality standards, $15.7 billion; (3A) correction of sewer infiltration/inflow problems, $5.3 billion; (3B) major sewer rehabilitation, $7.3 billion; (4A) collector sewers, $17.5 billion; (4B) interceptor sewers, $17.8 billion; (5) correction of combined sewer overflows, $31.1 billion; and (6) treatment and/or control of stormwaters, $235 billion. It is recommended that only Categories 1, 2, and 4B be used for allocation purposes, as the other categories could not be adjusted to correct unevenness in the data. (Lynch-Wisconsin)
W79-00248

LABORATORY STUDIES OF GAS TRACERS FOR REAERATION,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 5A.
W79-00270

CRITERIA DOCUMENT FOR DDT.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00276

ON THE VERTICAL DISTRIBUTION AND SEASONAL DEVELOPMENT OF THE DENSITY OF DREISSENA POLYMORPHA LARVAE IN THE PELAGIC ZONE OF THE LAKE OF ZURICH (IN GERMAN),
Gesundheitsinspektorat Stadt Zurich, (Switzerland).
For primary bibliographic entry see Field 5F.
W79-00280

CRITERIA DOCUMENT FOR TOXAPHENE.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00281

CRITERIA DOCUMENTS FOR ALDRIN/DIELDRIN.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00282

ASSESSMENT OF THE ENVIRONMENTAL IMPACTS ON THE BAN ON IMPORTS OF PCBS,
Versar, Inc., Springfield, VA.
R. P. Burruss, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 225, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/6-77-007, July 1977. 164 p, 5 fig, 12 tab, 3 app, 68 ref.

Descriptors: *Polychlorinated biphenyls, Import, Economics, Foreign trade, Path of pollutants, Mineral industry, Mining, Chemical wastes, Equipment, Industries, Water pollution sources, Organic compounds, Aroclors, *Water quality standards, *Polychlorinated terphenyls, *Industrial chemicals.

This report summarizes an investigation into the uses of imported polychlorinated biphenyls (PCBs) in the United States. Imported PCBs are presently used only for the maintenance of certain mining machinery. In addition, PCBs are present as a significant impurity in polychlorinated terphenyls (PCTs) imported for use in investiment casting waxes. Importation of PCBs for these uses will be banned after 1977 by the Toxic Substances Control Act, unless exemptions are allowed in accordance with the provisions of the Act. The recent Directive of the Council of the European Communities (EEC) prohibits use of PCBs and PCTs in investment casting waxes, but allows continued use of PCBs in mining machinery in Europe. (EIS-Deal)
W79-00290

VEGETATIVE STABILIZATION OF DREDGE SPOIL IN NORTH FLORIDA,
Florida A and M Univ., Tallahassee.
C. L. Coultas, G. A. Breitenbeck, W. L. Kruczynski, and C. B. Subrahmanyam.
Journal of Soil and Water Conservation, Vol. 33, No. 4, p 183-185, July-August 1978. 2 fig, 2 tab, 15 ref. Coop. St. Res. Serv. 516-15-27.

Descriptors: *Dredging, *Grasses, *Florida, Vegetation, Vegetation establishment, Estuarine environment, Coastal marshes, Coastal engineering, Estuaries, Fertilizers, *Dredge spoil, *Vegetation stabilization, Panic grass, Needlerush, Cordgrass, Saltgrass, Sandy spoil, Sea oats.

A North Florida estuary was the site for planting a sandy dredge spoil with panic grass, sea oats, and American beachgrass supertidaly, and needlerush, cordgrass, and saltgrass intertidally. Supertidal plants were fertilized at rates of 0, 100, and 200 pounds per acre with 10-10-10 fertilizer twice during the growing season. Fertilization increased total biomass of panic grass and height of sea oats. The 200-pound rate increased growth of beachgrass roots and rhizomes. Fertilization also increased the nitrogen, phosphorus, and potassium concentrations in some plants. Survival was poor among plants in the intertidal zone, probably because of the stress created by current and waves. (Roberts-ISWS)
W79-00337

THE BIOLOGICAL EFFECTS OF TOXIC MATERIAL SPILLS,
Environmental Protection Agency, Edison, NJ.
For primary bibliographic entry see Field 5C.
W79-00344

SAFETY ASPECTS OF TOXIC AND HAZARDOUS SPILLS,
Wood (William S.) and Associates, West Chester, PA.
W. S. Wood.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9831-0178 ($0.75). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 11-14, 1978.

Descriptors: *Safety, *Accidents, *Water pollution effects, *Toxicity, Safety factors, Chemicals, Corrosion control, Control system, Explosions, Burning, CHEMTREC, Hazards, Spills.

Spills of toxic substances which can occur through transportation accidents or various mechanical failures can have a variety of effects depending on the nature of the material spilled and where the accident occurs. Injuries can be incurred through direct contact with materials, such as corrosive chemicals or toxic fumes, and indirectly, through explosions and fires caused by ignition of flammable materials. The best control measures are improved design and adequate emergency planning. An example of an emergency assistance plan is CHEMTREC, operated since 1971 by the Manufacturing Chemists Association, Washington, D.C. CHEMTREC maintains a telephone service available to police and firefighters all over the country to supply vital information on handling dangerous spills. Several other programs and publications related to safety and handling of toxic spills are noted, including: Loss Prevention Symposia, held by AIChE, the 'Emergency Action Guide' published in 1976 by the U.S. Department of Transportation, and a training course for emergency services being developed by the National Fire Protection Association which was to be completed in November 1977. (See also W79-00342) (Majtenyi-IPA)
W79-00345

MANAGEMENT PLAN FOR CONTROL AND TREATMENT OF TOXIC SUBSTANCES,
Research Corp. of New England, Wethersfield, CT.
J. M. Purrington.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9874-0178 ($0.95). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 15-22, 1978, 4 fig, 13 ref.

Descriptors: *Safety, *Accidents, *Management, *Control, *Toxicity, Industrial plants, Methodology, Planning, Hazards, CHEMTREC, OHM-TADS, Control systems, Regulation, Pollution, Chemicals, Spills.

In view of government plans to increase regulation over handling of toxic substances, companies involved in this area must develop programs for control of such materials. The first step towards an effective management plan is learning applicable regulations and determining how they affect the particular installation. Next, an appropriate plan can be made and implemented. Factors to be considered are: potential sources of trouble, backup systems, containment procedures in case of accident, and detection monitors. An inventory of resources available to the plant is recommended and outside hotline information systems should be investigated, such as CHEMTREC, run by the Manufacturing Chemists Association and OHM-TADS, a computerized information system on hazardous material run by the Environmental Pro-

ection Agency. Specific methods are noted for handling spills on land and in water. For instance, materials like polyurethane foams and silica gels are used to contain toxic spills on land and insoluble toxic substances can be filtered or screened. (See also W79-00342) (Majtenyi-IPA)
W79-00346

LAKE SUPERIOR REGULATION EFFECTS,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 4C.
W79-00388

A STUDY OF COASTAL POLLUTION AND AGENCY INTERFACE,
University of Southern Mississippi, Hattiesburg. Coll. of Business Administration.
C. P. Cartee, and D. C. Williams, Jr.
Water Resources Bulletin, Vol. 14, No. 5, p 1167-1175, October 1978.

Descriptors: *Water pollution, *Coasts, *Agency-government interface, Regulation, Mississippi, Municipal governments, Board of Health, Air pollution.

The 26-mile man-made beach bordering part of Mississippi's Gulf Coast and the contiguous Mississippi Sound waters provide an important recreational and tourist attraction for that area. Being the tourist nucleus for the State, announcements in September 1973 by the Mississippi Air and Water Pollution Control Commission and the State Board of Health that Sound waters had reached a level of pollution that made them potentially dangerous for body contact was met with a myriad of responses. The resulting multigovernmental, multi-agency interface that resulted in trying to deal with the situation highlighted the type of problems that can arise when social, economic, political, and legal forces come to bear on a sensitive area. Questions of jurisdictional and legal authority to act, tourist industry economic pressures, and water quality testing and monitoring procedures were representative of the type of problems of articulation that it is essential between federal, state, and local agencies vested with responsibilities, such as monitoring water quality and protecting public health. This paper develops some of the interface complexities that emerged in dealing with this problem and makes selected recommendations for other areas that may potentially face similar situations. (Bell-Cornell)
W79-00389

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTATION REPORT,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00398

EPA'S GOAL FOR SUSPENDED SOLIDS IS NOT MET WITH MEDIA FILTRATION,
Procter and Gamble Co., Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W79-00414

AQUATIC INHABITANTS OF A MINE WASTE STREAM IN ARIZONA,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-00426

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
D. J. Jessup.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 138, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis. June, 1977. 94 p. 37 fig, 14 tab, 24 ref, append. OWRT A-046-TENN(2), 14-34-0001-7090.

Descriptors: *Stormwater, *Storm runoff, *Rainfall-runoff relationship, Hydrologic data, *Tennessee Valley, *Regional analysis, Urbanization, Runoff, Hydrographs.

Stormwater response was regionalized using hydrologic data from 17 urban and rural basins (0.24 to 117 sq. mi.). Lag time, the difference between 50% of runoff and rainfall excess volumes, is related to lag modulus (constant for a given land use) and the weighted rain excess intensity for the storm to the -0.4 power. This relation was derived from kinematic wave theory. Lag times were computed from optimized response functions associated with the TVA Stormwater (Double-Triangle) Model. Lag modulus was regionalized in terms of 8 significant watershed characteristics using principal components regression. The regionalization model facilitate simulation of the effects of stormwater response associated with urbanization.
W79-00447

A PILOT PLANT TRIAL FOR OZONE STERILIZATION OF FISH HATCHERY WATER,
Idaho Univ., Moscow.
T. J. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 045, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, October 1977. 113 p, 33 fig, 11 tab, 20 ref, 6 append. OWRT A-053-IDA(2), 14-34-0001-6013.

Descriptors: Fish, *Fish hatcheries, *Fish diseases, *Ozone, Ammonia, Nitrates, Water chemistry, Nitrification, Water quality, Disinfection, Waste water treatment, Water pollution treatment.

An ozone pilot plant was installed at the Dworshak National Fish Hatchery to examine the efficacy of sterilizing makeup water entering this recycle hatchery. The pilot plant actually consisted of two separate systems operated together . A recycle system consisting of two fish tanks, a clarifier and biofilter was in operation prior to this study. An ozone system consisting of a Grace ozone generator (later replaced by a Welsbach generator) and a Grace contacting column was installed for this study. The ozone pilot plant supplied the makeup water to the existing recycle system. The pilot plant was run with approximately 125 pounds of cutthroat and one-half pound of steelhead fry. Recycle rate was 30 GPM and makeup rate was 3 GPM. At the conclusion of the pilot plant study, an economic comparison was made of an ozone system and an ultraviolet system. The basis for comparison was a proposed 650 GPM system to be installed at Dworshak. Although the ozone treatment system requires a capital investment of $164,000 as opposed to $90,000 for an equivalent size ulraviolet system and an annual cost of almost $17,000 as opposed to $12,000 for the UV system, this study demonstrates the increased cost may be justified. The ozone system gave consistently greater sterilization efficiency than the ultraviolet system. It also showed consistently lower ammonia level and more uniform BOD concentrations. All of these effects would enhance fish survival.
W79-00455

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 4C.
W79-00460

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Science and Education Administration, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W79-00484

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

WASOPT USERS MANUAL: AN INTEGER PROGRAMMING METHODOLOGY FOR MUNICIPAL/REGIONAL WATER SUPPLY PLANNING,
Utah Water Research Lab., Logan.
T. C. Hughes, P. E. Pugner, and G. Clyde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 575, Price codes: A06 in paper copy, A01 in microfiche. Publication PRWG198-2, December 1977. 102 p, 17 fig, 2 tab, 5 append. OWRT B-145-UTAH(2). 14-34-0001-7132.

Descriptors: *Systems analysis, *Methodology, Water supply facilities, *Mathematical models, Model studies, Regional analysis, Planning, Optimization, Cities, City planning, *WASOPT methodology.

A systems analysis methodology is presented for identifying the least cost combination of municipal water supply facilities and operating rules. The planning package called WASOPT (Water Supply Optimization) includes the following procedures and capabilities: (1) The water supply and demand data (both existing and potential) are input in response to interactive statements from the computer in a form similar to that required for a manual solution to the planning problems; (2) WASOPT generates a mathematical model representing the problem's objective and constraints as defined by the input data; (3) the optimal solution is determined by use of a mixed integer programming algorithm; (4) the mixed integer programming solution is reported in a format designed especially for the municipal problem (in addition to the normal optimization package output). The procedure can be applied to regional or single complex municipal problems without revision to the generalized model form. The internal generation of the mathematical model totally eliminates the time consuming and error prone task of manually developing the model constraints and also allows use by planning engineers who have no previous knowledge of computer science or mathematical programing.
W79-00002

SHORTEST PATH PROBLEMS IN HYDROGEOLOGY,
Food and Agricultural Organization of the United Nations, Rome (Italy). Land and Water Development Div.
R. G. Thomas.
Ground Water, Vol. 16, No. 5, p 334-340, September-October 1978. 3 fig, 7 tab, 10 ref.

Descriptors: *Scheduling, *Hydrogeology, *Optimization, Operations research, Management, Networks, Planning, Groundwater, Theoretical analysis, *Shortest path, *Minimal spanning tree.

Many aspects of groundwater involve shortest path between two points and shortest round trips to many points. These problems are included in network theory, which is not easily available to groundwater specialists. This paper introduced some of the techniques which can be solved by hand for fairly small projects. Larger networks often can be divided into districts, each of which may then be amenable to hand solution. The

minimal spanning tree problem was described as background to the more useful problem of shortest path between two particular nodes. The matrix method is the simplest solution for the shortest path between all pairs of nodes and can easily be solved by hand for 30 or less nodes. This data can be used to determine which node is most centrally located and to determine a shorter round trip from one node to all others, returning to the origin. The matrix can be used for partial routes and for routing of two or more vehicles. (Visocky-ISWS)
W79-00137

CONJUNCTIVE USE OF GROUND AND SURFACE WATER,
Infotech, Tehran (Iran).
For primary bibliographic entry see Field 4B.
W79-00170

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX A,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00188

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX B,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00189

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY. APPENDIX C,
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00190

MODELING FOR ORGANIZATIONAL DECISION-MAKING: PROFITS VS. SOCIAL VALUES IN RESOURCE MANAGEMENT,
State Univ. of New York at Albany. School of Business.
H. Kahalas, and D. L. Groves.
Journal of Environmental Management, Vol. 6, No. 1, January 1978, p 73-84. 2 tab, 11 ref.

Descriptors: *Model studies, *Decision making, *Multiple purpose, *Forest management, *Goal programming, *Watershed management, *Analytical techniques, *Social values, *Alternative planning, Profit, Natural resources, Economics, Forestry, Social aspects, Forests, Recreation, Forest watersheds, Goals, Priorities, Methodology

A goal programming model is developed for multiple-use forest usage as a component of watershed management. The model is initially examined from an industrial perspective, then the priority structure is modified to coincide with societal forest use goals. Goal programming is superior to linear programming in forestry management in that it can handle conflicting goals ghrough the priority system and allow attainment of a solution by minimizing deviations from each specified goal. All constraints are treated as goals with associated priorities, so that values assumed by the deviational variables of each constraint determine the extent of goal achievement. Prioritized five-year industrial goals of a timbering company in the example are: (1) at lest $10,000 total profit, (2) at least 5% annual growth in net worth, (3) at least $3000 in dividends/yr, (4) watershed management on at least 200 acres/yr, (5) at least 150 wilderness acres reserve, and (6) at least 1000 acres provided for recreation. The company owns 3260 acres of forest land. In the first computer run all but goal (5) were at least partially attained. As revised according to social values, the priority ranking is: (1) watershed management, (2) wilderness preserve, (3) recreation, (4) profit, (5) net worth, and (6) dividends. In the new computer run, all but goal (6) are at least partially achieved. Incorporation by industry of societal goals is likely to have positive benefits for the company. (Lynch-Wisconsin)
W79-00243

MODELLING THE WATER QUALITY OF THE HYDROLOGICAL CYCLE.
For primary bibliographic entry see Field 5B.
W79-00379

STOCHASTIC PROCESSES IN WATER RESOURCES ENGINEERING.
Lund Inst. of Tech. (Sweden). Dept. of Water Resources Engineering.
For primary bibliographic entry see Field 8B.
W79-00380

STORMWATER MODELING,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00381

LAKE SUPERIOR REGULATION EFFECTS,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 4C.
W79-00388

LAKE LEVEL CONTROL AND MANAGEMENT--A CASE STUDY,
Barr Engineering Co., Minneapolis, MN.
For primary bibliographic entry see Field 4A.
W79-00390

OPTIMAL OPERATION OF SHELBYVILLE AND CARLYLE LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W79-00392

THE APPLICATION OF LINEAR PROGRAMMING TO RUN-OFF MANAGEMENT,
National Inst. of Agricultural Engineering, Silsoe (England).
For primary bibliographic entry see Field 4A.
W79-00393

DYNAMIC PROGRAMMING AND THE PRINCIPLE OF OPTIMALITY: A SYSTEMATIC APPROACH,
Princeton Univ., NJ. Dept. of Civil Engineering.
M. Sniedovich.
Advances in Water Resources, Vol 1, No 4, p 183-190, June 1978. 20 ref.

Descriptors: Water resources, *Dynamic programming, *Optimization, *Bellman's principle, Decision making, Equations, Mathematical models, Management, Systems analysis.

The dynamic programming recursive procedure has provided an efficient method for solving a variety of sequential decision problems related to water resources systems. In many investigations, Bellman's principle of optimality is used as a proof for the optimality of the dynamic programming (DP) solutions. Herein, the dynamic programming procedure is systematically studied so as to clarify the relationship between Bellman's optimality principle and the optimality of the DP solutions. The main result is that, although the principle is valid, in order to use it as a proof for the optimality of the DP solution, certain modeling requirements must be met. The model presented herein provides a convenient framework for the analysis of DP problems encountered in water resources management studies. The results derived resolve few of the fundamental questions raised in the literature regarding the validity of Bellman's principle of optimality and the optimality of the dynamic programming solutions. (Bell-Cornell)
W79-00396

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTATION REPORT,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00398

OPTIMAL SOLUTION TO THE TIMING, SEQUENCING, AND SIZING OF MULTIPLE RESERVOIR SURFACE WATER SUPPLY FACILITIES WHEN DEMAND DEPENDS ON PRICE,
California Univ., Los Angeles.
N. Y. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 155, Price codes: A07 in paper copy, A01 in microfiche. Ph.D Dissertation, June 1977. 128 p, 12 fig, 6 tab, 55 ref, 2 append. OWRT C-5184(No 4208)(5), 14-31-0001-4208.

Descriptors: *Model studies, *Water resources development, *Optimum development plans, *Planning, *River basin development, *Reservoir yield, Economic efficiency, Operations research, Dynamic programming, Water supply, Water demand, Welfare(Economics), Econometrics, Pricing, Computer programs, Optimal timing, Demand curves.

A general multi-period planning model for the optimal timing, sizing, and sequencing of reservoir additions to surface water supply is presented. The objective of the model is the maximization of net economic efficiency benefits subject to hydrologic system constraints. The model is designed to handle system increments which are unique and interdependent. Since firm water, the product of the system, is dependent on existing reservoir sizes, configurations, and hydrologies a rational operating scheme is incorporated into to the optimization. A price-sensitive demand curve which changes according to a prescribed growth rate is used. Firm water demand is thus sensitive to changes in price and time as opposed to most fixed demand requirement approaches. Benefits are measured by the willingness-to-pay cncept. Known reservoir cost relationships which are a function of project capacity determine cost relationships which are a function of project capacity detemine costs. A forward dynamic programming algorithm is used for solution. The model is tested with an application to the Eel River Project in Northern California. The discount rate, growth rate, and demand elasticity are parameterized and tested over several values. (Yeh-Calif)
W79-00438

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS,
Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Department.
For primary bibliographic entry see Field 4C.
W79-00450

OPERATING MODEL FOR THE GREEN RIVER BASIN RESERVOIR SYSTEM,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-00452

6B. Evaluation Process

WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.
For primary bibliographic entry see Field 6D.
W79-00007

A COMPARATIVE STUDY OF COMMUNITY RESPONSE TO WATER RELATED PROBLEMS,
Delaware Univ., Newark. Dept. of Sociology.
D. Wenger, and T. Leitko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 688, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, December 22, 1977. 85 p, 26 tab, 30 ref. OWRT A-031-DEL(2). 14-34-0001-6008.

Descriptors: Social aspects, *Social change, *Urban sociology, *Decision-making, *Water resources, Development, *Community development, *Attitudes, *Community power.

This study examines the nature of local power actors' definitions, perceptions, and proposals for solving water resource and general community problems. The responses of power actors in six communities in Delaware are compared with those from power actors in ten midwestern communities. In general the findings from Delaware tend to support the prior midwestern research. In both settings while local leaders are aware of local water resource problems, these are not important, salient concerns to them. In Delaware water resource problems are viewed as being less serious than was the case in the midwest. In both settings, however, there is little consensus among local leaders concerning the severity of local water resource and general problems. Also, there is a lack of faith in the local communities' ability to solve water resource problems by themselves. However, overall the level of inactivity with respect to water resource problems is perceived to be less in Delaware than in the midwest. Furthermore, the power actors in Delaware generally held positive or neutral attitudes toward the helpfulness and effectiveness of state, county, and federal agencies with respect to water resource planning. In addition, a comparison was made of community residents perception of problems with those of local power actors in Delaware. As compared to the power actors, local residents are more likely to perceive the existence of water resource problems, are less likely to see the local community as being able to solve them, and are less likely to perceive any local activity to solve them. Finally, residents in Delaware perceive protest activities as being the most effective devices for having their political demands met.
W79-00010

PROTECTION OF OUTDOOR RECREATION VALUES OF RIVERS.
Heritage Conservation and Recreation Service, Washington, DC.
1978 Nationwide Outdoor Recreation Plan, Task Force Report. 39 p, 4 append.

Descriptors: *River protection, *Recreation, *Wild rivers, *Conservation, *Wild River Act, Scenery, Suwannee River, Housatonic River, River conservation, Georgia, Florida, Connecticut, Massachusetts, Environment, Ecology, Wild and Scenic Rivers System, River regulation, Rivers, Interstate rivers, Federal Government, Legislation.

Issues surrounding river protection in America are examined and action alternatives for resolution of these issues are proposed. Four major issues are identified: (1) protection of rivers is viewed as the exception rather than the rule; (2) there is no national focus on recreation and urban rivers; (3) wild and scenic river protection has been slow, costly, and inadequate; and (4) Federal leadership and coordination is inadequate. A number of options for Federal action are proposed. Among the legislative options are: authorization of a River Conservation Revolving Fund to be administered by the Secretary of the Interior; and amendment of the Wild and Scenic Rivers Act to provide financial assistance to States to administer nationally designated rivers. Other options relate to possible executive action directing all Federal agencies to give special recognition and protection to designated wild and scenic river areas, including studies on those areas considered potential additions to the National Wild and Scenic Rivers System. In addition, 14 specific suggestions for agency actions are made for improving and strengthening river protection and conservation. Case studies on the Suwannee River in Georgia and Florida and the Housatonic River in Connecticut and Massachusetts are provided. (Majtenyi-IPA)
W79-00093

PUBLIC OUTDOOR RECREATION BENEFITS OF FEDERAL WATER RESOURCE PROJECTS.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-00094

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-00095

ENERGY CONSERVATION AND OUTDOOR RECREATION,
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-00096

NEEDS OF PRIVATE FOR PROFIT ENTERPRISES IN OUTDOOR RECREATION.
Heritage Conservation and Recreation Service, Washington, DC.
1978 Nationwide Outdoor Recreation Plan, Task Force Report. 55 p.

Descriptors: *Recreation, *Private recreational industry, *Recreation demand, Recreation facilities, Private concessions, National parks, Parks, Energy consumption, Legislation, Land management.

With continued public demand for greater recreational opportunities, the private sector is demonstrating its competence to provide clean, wholesome and innovative recreation. This creates jobs, incomes and tax revenues; however, Federal agencies are limiting and sometimes even prohibiting activities of the private sector. New Federal policy is needed to ensure that Federal recreation and tourism agencies clear with private sector before purchasing and developing land, and existing policies need to be revised to permit greater support and participation by the private sector on presently-owned and managed Federal recreation lands. Problems and liabilities facing private sector business in the recreation and sports area are described along with current efforts to resolve these issues. Such problems include costs of insurance, regulatory confusion and over-regulation by government, and difficulties involved with private concessions operating on public lands. In each case the discussion includes a statement of issue, background, and a description of current efforts to resolve the problem. Other issues discussed are: highway signs, technical assistance and education to aid private sector decision makers, energy management, nationwide outdoor recreation policy development and the role of the private sector in forming it. (Majtenyi-IPA)
W79-00097

ROLES/FUNCTIONS OF FEDERAL, STATE AND LOCAL PUBLIC AGENCIES.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-00098

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
W. F. Schweri, II, and J. Van Willigen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 624, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 110, June 1978. 142 p, 72 ref. OWRT A-063-KY(1), 14-34-0001-6018; 7037 and 7038.

Descriptors: Social Aspects, *Social impact, Decision making, Leadership, Resistance, Resistance networks, *Social values, *Kentucky, Reservoirs, Environmental effects, *Pre-impoundment, Organized resistance, Voluntary association, Social cost, Sentiment systems.

This is a case study of a group organized to resist the construction of an Army Corps of Engineers reservoir project located in Eastern Kentucky. The account describes how a group of landowners organized and enacted an increasingly complex strategy of resistance. Within this framework perceived costs, leadership and authority and group organization are considered. The primary research method employed was that of repeated interviews with members of the resistance organization who were identified as key informants. These interviews were carried out on both structured and unstructured bases. The formal analysis of the voluntary association data emphasized the process of resistance. That is, the report depects the evolution of persisting resistance oranization. The conclusions include recommendations to both project resisters and project planners. (Huffsey-Kentucky)
W79-00142

ON THE ENVIRONMENTAL EFFICIENCY OF ECONOMIC SYSTEMS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6G.
W79-00230

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT: DISCUSSION,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
R. Marasco.
American Journal of Agricultural Economics, Vol 59, No 5, p 885-886, December 1977. 1 ref.

Descriptors: *Fisheries, *Fish management, *Commercial fishing, *Economics, *Jurisdiction, *Welfare(Economics), Model studies, Research priorities, Fish conservation, Institutional constraints, Regulation, Economic efficiency, Fishery Conservation and Management Act of 1976, Theoretical analysis, Political constraints.

This critique of Huppert's 1977 paper agrees with the author's list of constraints to welfare gains in U.S. fisheries management but adds: (1) knowledge deficiencies associated with both biological and economic fishery systems, and (2) cost of instituting and enforcing regulatory programs. Development of more refined and realistic empirical bioeconomic models would facilitate

enactment of regulations by the councils designed to promote sound fishery operations. However, data inadequacy coupled with data acquisition costs hinders development of such models. Data is needed on salinity, temperature, prevailing currents, and number and feeding habits of stock as well as other fish species. Deficiencies also exist in the economic data base, including recreational use of fish, nature of food fish consumption, substitutability among species by consumers, restaurant consumption, foreign fish markets, competition in the processing sector and its capacity and costs, harvesting costs and capacity, and fishing effort. Costs associated with implementation and enforcement depend upon the nature of the regulatory measures selected. Enforcement costs for programs requiring either aerial or ship surveillance will be high. (Lynch-Wisconsin)
W79-00231

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER,
Department of Justice, Washington, DC. Antitrust Div.
F. W. Gramlich.
National Tax Journal, Vol 30, No 2, p 183-194, June 1977. 5 tab.

Descriptors: *Charles(MA), *Water quality control, *Boston(MA), *Surveys, *Attitudes, *Willingness to pay, Cost-benefit analysis, Massachusetts, Social values, Regression analysis, Cities, Swimming, Economics, Rivers.

Costs and benefits were judged about equal in the case of swimmable water in the Charles River, according to a willingness-to-pay survey of 165 families in metropolitan Boston. Determinants of willingness to pay were isolated using regression analysis, and an estimate of aggregate benefit from improving water quality was developed from the regressions and compared to resource costs. The estimated range of aggregate benefits is $8.8-21.9 million, an average of $15.4 million, while estimated aggregate costs are $16.7 million. Interviews and questionnaires were administered September-November 1973. Family income, education, proximity of home and workplace to the river, graduate student status, and probability of future residence were all positively correlated with willingness to pay. Residence in the region as a percentage of age, percent of past life in the area and age alone were inversely related to willingness to pay, and ownership produced mixed results. Independent variables considered in the analysis were: (1) discretionary permanent family income, (2) graduate student status, (3) age of respondent, (4) completion of high school, (5) completion of college, (6) residence distance from the river, (7) percent of family working or attending school near the river, (8) product of ownership and variable 9, (9) probability of future residence in the area, (10) percent of past life in the area, (11) hrs of family river recreation, and (12) swimming ability. (Lynch-Wisconsin)
W79-00234

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT: DISCUSSION (ANDERSON),
Delaware Univ., Newark. Dept of Economics.
For primary bibliographic entry see Field 6E.
W79-00235

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POLICY AND RESEARCH ISSUES IN THE FISHERY,
Wisconsin Univ.-Madison, Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W79-00236

DISTRIBUTIONAL IMPLICATIONS OF EXTENDED FISHERIES JURISDICTION: SOME RESEARCH AND POLICY ISSUES: DISCUSSION,
Rhode Island Univ., Kingston, Dept. of Resource Economics.
For primary bibliographic entry see Field 6E.
W79-00237

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POLICY AND RESEARCH ISSUES IN THE FISHERY: DISCUSSION,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6E.
W79-00238

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT,
National Marine Fisheries Service, La Jolla, CA.
For primary bibliographic entry see Field 6E.
W79-00240

NATURAL RESOURCE ECONOMICS: THE UPSETTING DISCIPLINE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
M. M. Kelso.
American Journal of Agricultural Economics, Vol. 59, No. 5, December 1977, p 814-823. 15 ref.

Descriptors: *Natural resource economics, *Economics, *Environmental economics, *Agricultural economics, *Theoretical analysis, *Socioeconomic theory, Public lands, Australia, Nauru Island, Goals, Land values, Value, Land economics, Land use, Output, Maximization.

This paper, the test of a lecture, describes the author's efforts during his academic career to rationalize natural resource economics (formerly land economics) with conventional economic theory, particularly agricultural economics. The basic conflict is seen as a question of goals; the goal of standard economics is output maximization within constant external variables of preferences and institutions, taken from a short-run perspective, which is replaced in natural resource economics with the goal of maintaining or improving capital stock and the bodies and minds of the aggregate system in a long-run or even infinite time span, and in a closed system. Boulding's 1966 paper on earth viewed as a spaceship rather than as a limitless plain pointed the direction that resolution of the paradox of natural resource economics must take. This vision requires traumatic adjustment of ethical, religious, cultural, and intellectual systems. The problem of public lands is also discussed, here portrayed as a conflict of landlord-tenant relationships versus private ownership of those lands. Whereas a rancher can correctly be visualized as a private firm, the structure, role, and behavior of a public landlord has never been resolved. The issue of aggregate agricultural land values is discussed, with examples from Australia and Nauru Island in the southwest Pacific Ocean. (Lynch-Wisconsin)
W79-00242

MODELING FOR ORGANIZATIONAL DECISION-MAKING: PROFITS VS. SOCIAL VALUES IN RESOURCE MANAGEMENT,
State Univ. of New York at Albany. School of Business.
For primary bibliographic entry see Field 6A.
W79-00243

LAND PRICES SUBSTANTIALLY UNDERESTIMATE THE VALUE OF ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 6C.
W79-00244

THE NATIONAL WATER COMMISSION REVISITED PERSPECTIVE ON NATIONAL WATER POLICY STUDIES, WITH SOME IMPLICATIONS FOR CHANGES IN FUTURE WATER POLICY,
National Research Council, Washington, DC. Commission on Natural Resources.
For primary bibliographic entry see Field 6E.
W79-00383

BRUSHLAND WATERSHED FIRE MANAGEMENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
R. G. Lee, and T. M. Bonnicksen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 523, Price codes: A05 in paper copy, A01 in microfiche. Technical Completion Report Contribution No. 172, ISSN 0575-4941, August 1978, 74 p. (California Water Resources Center Project UCAL-WRC-W-499). OWRT-A-058-CAL(1).

Descriptors: *Brushlands, *Watershed management, *Forest fires, Political aspects, History, *California(Southern).

Results from the Cleveland National Forest and Angeles National Forest case studies are summarized as three interpretations of brushland watershed fire management policy. A historical description of fire exclusion shows the influence of flood control and water related interest groups in shaping current policies. An abstract interpretation of the linkage between present interest-groups and watershed conditions shows that the fire exclusion policy is less to satisfy all interests than a rotation burning policy applied at individual watershed levels. A more abstract interpretation discusses the hypothesis that the fire exclusion policy persists because it stimulates increasing expenditures for fire exclusion through hazardous fuel accumulation. The report describes and evaluates the effect of restrictions on governmental spending, energy shortages, decreasing importance of local water supplies, and changes in the legal framework governing fire management on fire exclusion policy. (Snyder-California)
W79-00449

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 4C.
W79-00460

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WET COOLING TOWER BACKFITTING ECONOMICS,
Iowa Univ., Iowa City. Div. of Energy Engineering; and Iowa Univ., Iowa City. Div. of Research Engineering.
For primary bibliographic entry see Field 5G.
W79-00233

THE OPTIMAL PRICING OF UNDEPLETABLE EXTERNALITIES,
Department of Energy, Washington, DC Office of Conservation and Solar Applications.
N. D. Uri.
Environment and Planning A, Vol. 10, No. 3, p 287-294, 1978. 5 ref.

Descriptors: *Optimization, *Pricing, *Undepletable externalities, *Emission standards, *Economics, Externalities, General equilibrium models, Pareto optimality, Standards, Air pollution, Model studies, Analytical techniques.

atisficing' approach is used to derive the -optimal (or second-best) Pareto pricing solu- esulting from imposition of an emission stan- on an undepletable public good externality. mation requirements have led economists to ie satisficing approach, in which the most ef- t method of obtaining an ex ante selected ion level is sought, the resulting solution second-best. Baumol and Oates have nstrated that the price system can provide an tive allocative mechanism only for depletable nalities; undepletable externalities are more ult to analyze. An undepletable externality is gous to a public good's externality in that an ase in the consumption of the good by one n doe not reduce its availability to another, as breathing polluted air. In this study, a com- ve general equilibrium pricing model in the hi framework is the basic analytical tool The solution yields two results: (1) If an ive fee achieves the emission standard, the on will be quasi-optimal Pareto in the sense consumers will have maximized their utility ie given level. (2) The appropriate emission ould be equal to that given by either of two ions included in the analysis, which require information than does the Baumol and Oates on, but which probably result in a fee requir- ewer iterations to reach the selected emission ard. (Lynch-Wisconsin)
00239

O PRICES SUBSTANTIALLY UNDERESTI- E THE VALUE OF ENVIRONMENTAL LITY,
Niskanen, and S. H. Hanke.
Review of Economics and Statistics, Vol. 54, , August 1977, p 375-377. 1 tab, 15 ref.

riptors: *Prices, *Land resources, *Value, ironmental economics, *Discount rates, ity, *Public policy, Cost-benefit analysis, retical analysis, Mathematical models, Model es, Equations, Governments, Opportunity

of land prices to represent values of environ- al amenities significantly understimates en- mental quality because this method excludes overnment's equity in land. It has generally assumed that benefits of a public policy or ct are quivalent to the difference in the mar- price of the affected land, that is, the unted present value of the flow of net ues and services received by private owners e lands has been the only value considered. ever, this measure underestimates total land ctivity differences because local govern- s also have an equity interest in the land, land valuation is a base for property taxes. A l illustrates the relationship between dif- ces in the total value of land and differences market prices. The total value of land is ex- ed by V=P+G=R/i=P(1+t/i), where P is the et price of land, G is governmetn equity, R is nnual rental value of land without property , i is the rel opportunity cost of capital to te owners, and t is the effective property tax n the market price of land. The difference in property value due to a policy change is: delta elta P(1+t/i). It is seen that in several studies ence in land values was underestimated by %. (Lynch-Wisconsin)
00244

NOMIC IMPACTS OF PULP AND PAPER STRY COMPLIANCE WITH ENVIRON- TAL REGULATIONS. VOLUME I. SUM- Y AND AGGREGATE INDUSTRY IMPACT LYSES.
(Arthur D.), Inc., Cambridge, MA.
rimary bibliographic entry see Field 6E.
00430

6D. Water Demand

WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.
T. L. Elchak, D. L. Raphael, J. P. Ignizio, and H. H. Martinez.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 577, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, The Pennsylvania State University, Institute for Research on Land and Water Resources, September 1978. 138 p, 13 tab, 10 fig, 5 append. OWRT A-048-PA(3). 14-34-0001-7080.

Descriptors: *Water supply, *Water demand, Water utilization, *Pennsylvania, Water resources, Water shortage, Water use, *Model studies, Interactive water, Energy model, *Water use functions, *Energy supply, Demand, *Linear flow model, *Optimization, Electrical generation, Energy demand, Energy supply.

Growing energy demands and dwindling energy supplies have only recently become topics of national and worldwide concern. The economic and energy crises of the 1970's have amplified these concerns. Likewise, water resources are presumed non-exhaustible and are only serious topics of interest when severe water shortages or natural catastrophies strike regional areas of the country. The two types of resources, energy and water, are vitally linked together because energy supply, conversion and end use depend heavily upon water resources. An interactive water/energy model is presented for the state of Pennsylvania. An independent water model and energy model are joined together to show the interactions between energy supply and demand with the supply of water. These interactions are depicted by water use functions for various energy sectors. Specific examples are presented for the electrical generation sectors. Two hypothetical scenarios are presented to show the use of the model as a planning tool. One scenario utilizes goal programming to optimize a number of energy uses at different priority levels. Some recommendations are offered. (Sink-Penn St)
W79-00007

POINT SOURCE ANALYSIS. INVENTORY, WATER DEMANDS, AND PROBLEM AREA IDENTIFICATION. (AREAWIDE WASTE TREATMENT PLAN FOR THE GREATER HOUSTON AREA. SECTION 208, PL 92-500.
Houston-Galveston Area Council, TX.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 761, Price codes: A06 in paper copy, A01 in microfiche. July 1977. 107 p, 30 tab, 2 append.

Descriptors: *Water management, *Water demand, *Water supply, *Water utilization, *Water policy, *Water quality, *Houston, *Galveston, Federal Water Pollution Control Act, Water allocation(Policy), Groundwater, Surface water, Waste water, Municipal wastes, Industrial wastes, Water pollution, Surface waters, Data collections, Future planning(Projected), Water quality.

A point source inventory was carried out to locate and characterize significant industrial discharge to the municipal sewer system and directly to surface waters within the greater Houston area. Data, such as identity, locations, and characterization of sources were incorporated into storage-retrieval systems and discharge points were plotted on location maps. Water demands were modeled for the planning period 1975 to 1995 and projected according to sub basin and user. Separate equations were used for industrial, agricultural, power generation, and domestic categories. It is predicted that, in general, water demands will exceed supplies in future years, although a number of factors will mitigate the deficits. These factors are described in detail and attempts were made to identify which sources could meet specific demands. Also, efforts were directed toward allocating demands to groundwater or surface water supplies and ordering allocations by user category and sub basin. Finally, the existing water quality and projected wasteloads were identified for specific stream segments. Ten of these segments which are not expected to meet water quality standards were designated problem areas. The methodologies used to project industrial wasteload and municipal wasteload are described in the appendices. (Majtenyi-IPA)
W79-00104

WATER USAGE REQUIRES PLANNING,
Universal Oil Products, Inc., Saint Paul, MN. Johnson Div.
R. J. Havrilak, Jr.
Johnson Driller's Journal, Vol. 50, No. 4, July-August, 1978, p 4-5. 1 fig.

Descriptors: *Water utilization, *Water management(Applied), *Planning, Water demand, Water quality, Water permits, Water resources development, Ground water, Surface water.

Over 420 billion gallons of water are used each day in the United States. This usage is controlled by water resources development plans that vary in complexity and scale from an individual water source to an industrial or municipal water supply. The water quantity and quality for the intended use should first be determined from available data. Then, a source must be found in ground water, surface water, or a combination of both. Ground water and surface water availability maps can be obtained from state and national geological surveys. Withdrawals from surface and ground water supplies are controlled by various regulatory agencies. Where possible, a comparison of all potential sources should be made, including such considerations as reliability, treatment requirements, initial cost, maintenance and operating costs, and compliance with government regulations. Once a suitable source has been chosen it should be developed to its full potential. With ground water, this means paying attention to the aquifer characteristics, well construction, and drilling and development techniques. With surface water, special attention must be directed toward the design and siting of the intake screen, cleaning the screen, and keeping entrance velocity low--less than .5 FPS--at any point on the screen. (Purdin-NWWA)
W79-00183

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975. SUMMARY REPORT.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00191

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER,
Department of Justice, Washington, DC. Antitrust Div.
For primary bibliographic entry see Field 6B.
W79-00234

RESIDENTIAL WATER CONSERVATION,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 3D.
W79-00440

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES,
Chicago Univ., IL.
M. Lounsbury, S. Hebenstreit, and R. S. Berry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 046,

Price codes: A10 in paper copy, A01 in microfiche. University of Illinois Water Resources Center, Urbana, Research Report No. 134, July 1978. 189 p, 46 fig, 79 tab, 2 ref, 2 append.

Descriptors: *Energy, Irrigation water, *Municipal water, *Water supply, Energy analysis, *Municipal sewage treatment, Growth rates, Energy requirements.

Energy and water are linked resources. This pilot study examines the relationship between energy and water from a direction opposite to that of most studies. An evaluation is made of the energy required to supply and treat water, rather than the water requirements of energy production. The primary energy requirements for three sectors of water management--municipal water supply, municipal sewage treatment, and water for irrigation--are evaluated. Six major cities, Chicago, Denver, Los Angeles, New Orleans, San Antonio, and St. Louis, are used as indicators of the national trend in energy requirements to supply water municipalities. Nationwide data provided by the federal Environmental Protection Agency for 1977 and 1990 are used to determine the rate of change of energy required to treat municipal sewage over this period. The energy required to supply water for irrigation is estimated for three regions in the Southwest: Kern County, California; the Texas high plains; and San Carlos, Arizona. Historic trends and prospects for future development are used to estimate future energy requirements for each of these water sectors. The projections are compared to expected increases in national energy consumption. The results indicate that: (1) regional differences in the amount of energy needed to supply water are very large, increasing in some places and decreasing in others; (2) significant nationwide increases are likely for the energy required to treat sewage; and (3) noncritical short-term increases will occur in the total energy requirement to supply irrigation water, but after the year 2000, the Southwest faces an extremely difficult choice in balancing its resources of energy, water, and agricultural land, particularly in the light of its growing urban demands.
W79-00453

6E. Water Law and Institutions

A COMPARATIVE STUDY OF COMMUNITY RESPONSE TO WATER RELATED PROBLEMS,
Delaware Univ., Newark. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W79-00010

PROTECTION OF OUTDOOR RECREATION VALUES OF RIVERS.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-00093

PUBLIC OUTDOOR RECREATION BENEFITS OF FEDERAL WATER RESOURCE PROJECTS.
Heritage Conservation and Recreation Service, Washington, DC.
1978 Nationwide Outdoor Recreation Plan, Task Force Report. 39 p, 1 append.

Descriptors: *Water resources, *Recreation, *Environmental resources, *Water resources development, *Water policy, Wetlands, Floodplains, Coastal beaches, Lakes, Water utilization, Estuaries, Water resource programs, Federal water policy, Federal Government.

Seven national water related recreation and environmental action objectives are identified and methods for fulfilling these objectives are suggested. Topics covered include: maintenance of instream flows; evaluation and protection of wetlands, estuaries and other important areas; protection and enhancement of flood plains; direction and encouragement of maximization of cost-effective recreation opportunities, and Federal water resource development projects. Following a statement of each action objective, background related to the objective is provided, directly related authorities (statutes, Executive Orders and other Presidential documents or directives to the Executive Branch) are identified, action needs are briefly discussed, and action options are presented. The appendix provides a list of authorities cited and a brief description of applicable sections. (Gibson-IPA)
W79-00094

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF.
Heritage Conservation and Recreation Service, Washington, DC.
1978 Nationwide Outdoor Recreation Plan, Task Force Report. 22 p. 2 tab, 1 append.

Descriptors: *Recreation, *Land development, *Land management, *Land and Water Conservation Fund(LWCF), National Park Service, Forest Service, Fish and Wildlife Service, Wild and Scenic River Act, National Wilderness Preservation Systems Act, National Recreation Areas, Federal Government, Land use.

Federal policy as it relates to Federal land acquisition for recreational, natural, and cultural resources, is examined. Included is a brief description of the Land and Water Conservation Fund (LWCF) Act of 1965, what has been accomplished with the LWCF, and what future demands are expected on the fund. At present some 27 different authorities can be used by the Forest Service, National Park Service, Fish and Wildlife Service, and the Bureau of Land Management, to obtain land for over 20 separate land categories. Also, there may be conflicts or at least ill-defined authority relating to specific land preservation acts, such as the National Wilderness Preservation System Act and the Wild and Scenic Rivers Act. It is recommended that an effective Federal policy contain a clearly stated direction, standards and guidelines for implementation, and a statement of responsibilities and process delineating appropriate agency actions. Agencies using the LWCF, their acquisition's policy, authorities, types of area acquired and acquisition priorities are listed in the appendix. (Majtenyi-IPA)
W79-00095

ROLES/FUNCTIONS OF FEDERAL, STATE AND LOCAL PUBLIC AGENCIES.
Heritage Conservation and Recreation Service, Washington, DC.
1978 Nationwide Outdoor Recreation Plan, Task Force Report. 39 p, 3 tab, 1 ref.

Descriptors: *Recreation, *Legislation, *Recreation facilities, *Land management, *State Government, *Local Government, Social needs, National recreation areas, State recreation areas, Conservation, Land use, National parks, Scenery, Water management, Government.

In the past, proliferation of Federal actions, aid, and assistance programs throughout some 50 bureaus, 35 offices, and numerous commissions has created confusion and inhibited coordination in the field of outdoor recreation. This review examined existing systems to determine how some policies might be changed or shifted to yield a more logical approach. The historical perspective on outdoor recreation policy is traced from pre-World War II to the present with a brief summary of the Acts and Federal studies in this field. A philosophy for recreation roles and responsibilities is defined for various segments of society. For example, the Federal role, in addition to its legislated land and water management responsibility, will primarily be supportive to the extent of providing the incentive and assistance for State and loc governments. Local governments will look t these upgraded state programs for guidanc funds, and for producing on-the-ground result The private sector will complement the Stat local-Federal role by providing additional servic and facilities where profit and price are a pa Private non-profit organizations can play a vit role in providing recreation opportunity, esp cially in flexibility, diversity and cost-effecti uses. The private citizen should take part planning at all levels to represent the user's vit poinnt of view. More detailed jurisdictional lev responsibilities for outdoor recreation are e plained for each segment listed above, but the r port stresses that the most important factor achieving an efficient recreation program is the i terrelationship and interdependence of all the segments. (Majtenyi-IPA)
W79-00098

POINT SOURCE ANALYSIS. INVENTOR WATER DEMANDS, AND PROBLEM ARE IDENTIFICATION. (AREAWIDE WAST TREATMENT PLAN FOR THE GREATE HOUSTON AREA. SECTION 208, PL 92-500.
Houston-Galveston Area Council, TX.
For primary bibliographic entry see Field 6D.
W79-00104

THE DEVELOPMENT OF THE ELECTRICA POWER SYSTEM IN THE PACIF NORTHWEST, A PUBLIC POLICY PERSPE TIVE,
Washington Univ., Seattle.
R. G. Walton.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-287 62 Price codes: A09 in paper copy, A01 in microfich M.S. Thesis, 1976, 174 p, 6 fig, 6 tab, 2 maps, ref, 9 append. OWRT A-079-WASH(2).

Descriptors: *Electrical power system, *Pacif Northwest, Policy, *Decision-making.

The objective is to provide a description and an ysis of the development of the electrical ener system in the Pacific Northwest from the la 1950's to 1976, from a public policy perspectiv Unprecedented changes have appeared in the ele trical energy picture in the PNW in recent year and the near future promises to produce addition decisions of significant importance to the regio The arrival of large capacity thermal-electr power plants in the region (both coal and nuclea and plans for many more, have been accompani by greatly increased public attention to energy a the environment. The controversies that have e sued are complex, and the manner in which th are to be resolved is of great interest and conce to a large number of individuals and organization In spite of these facts, however, the level citizen awareness of the region's plans for electr cal power development, how these plans ha been chosen, and by whom, appears to remain at very low level. Considerable attention has be given to the historical evolution of the regio power system. This has helped to place the prese dilemma in context as the requirements placed c electric energy planners have evolved with th growth in generation and use of electricity.
W79-00143

REGIONAL ELECTRIC ENERGY PLANNIN A CASE STUDY IN THE POLITICS OF SCARC RESOURCES,
Washington Univ., Seattle.
A. Birmingham.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-287 62 Price codes: A08 in paper copy, A01 in microfich Master Thesis, 1976, 128 p, 1 map, 92 ref. OWR A-079-WASH(1).

criptors: *Regional electric energy, *Planning, cific Northwest, Institutional framework, Is-, Seattle City Light, Revisions, Washington, gon.

ttempt was made to examine the regional elec- energy picture in the Pacific Northwest. Using Bonneville Power Administration and Seattle Light as two major foci, the analysis usses the past and present interaction of the onal electric energy planning entities. The or contention is that the utility industry faces ncreasingly difficult set of policy decisions e lacking an adequate institutional framework hich to resolve them. This void is exacerbated he imminence of decreasing resources, both ronmental and financial. These shortages e, in turn, made the consequences of utility ac- s increasingly significant. The implications and lts of this lack are discussed and some poten- solutions suggested.
-00144

NSTRAINTS TO WELFARE GAINS UNDER TENDED JURISDICTION FISHERIES NAGEMENT: DISCUSSION (ANDERSON),
aware Univ., Newark. Dept of Economics.
. Anderson.
erican Journal of Agricultural Economics, Vol. No. 5, p 883-884, December 1977. 2 ref.

criptors: *Fisheries, *Fish management, mmercial fishing, *Economics, *Jurisdiction, elfare(Economics), Fish conservation, Fishery servation and Management Act of 1976, oretical analysis, Institutional constraints, ulation, Economic efficiency, Political con- ints, Taxes.

ritique of Huppert's 1977 paper on constraints welfare gains in U.S. fisheries management ises on the definition of welfare, provisions of Fishery Conservation and Management Act of 6 (FCMA) relating to economic allocation and ciency, and recreational fishing data. Accord- to Huppert, 'welfare gains' are really potential fare gains, or more properly, the attainment of nomic efficiency. Huppert identifies five ential barriers to economic efficiency: (1) over- ing authority among states and foreign coun- ; (2) provisions of FCMA, especially restric- s on taxes as a regulation tool; (3) the regional ntation of the councils; (4) industry comination he councils; and (5) inadequate knowledge of eational fishing. National standard 5 of FCMA es that 'conservation and management mea- s shall...promote efficiency in the utilization ishery rsources; except that no such measure l have economic allocation as its sole purpose.' second phrase essentially negates the first, could more seriously retard progress toward nomic efficiency than restrictions on use of s. Preliminary guidelines for implementing MA do not entirely clarify the relative empha- o be given economic efficiency as a manage- t goal. The lack of data on recreational fishing ally a problem of lack of adequate social and nomic information in general. (Lynch-Wiscon-

-00235

TRIBUTIONAL IMPLICATIONS OF THE TENDED ECONOMIC ZONE: SOME POL- AND RESEARCH ISSUES IN THE HERY,
consin Univ.-Madison, Dept. of Agricultural nomics.
V. Bromley.
erican Journal of Agricultural Economics, Vol. No. 5, p 887-892, December 1977. 9 ref.

criptors: *Fisheries, *Fish management, stribution, *Access, *Economics, elfare(Economics), *Public policy, Jurisdic- , Model studies, Research studies, Theoretical ysis, Policy, Commercial fishing, Income dis- tribution, Economic efficiency, Social aspects, Social impact, General equilibrium models, Willingness to pay.

In economic analysis of extended fisheries jurisdiction, important insights are gained by a more careful specification of the traditional steady-state/yield-effort models, and by viewing extended jurisdiction economics in the framework of welfare theory. Fishery distribution is analyzed, a simple model is presented for assessing international distributional implications of extended jurisdiction, access to the enlarge domestic fishery is discussed, and research and policy implications are reviewed. Distributional aspects have been ignored because economists have been using the wrong conceptual framework; traditional fishery models consider fishermen mere factors of production, aggregated as 'effort', not as independent decision-making units. Applying welfare economics to the fishery problem focuses distribution as central to any policy recommendation. Considerable difference of opinion exists regarding the role of economics in determining who should have access to the fishery; various aspects of valuation of those desiring access are discussed. As devastating long-run economic losses can accure to those denied access to the fishery, it would seem logical that economics should have something to offer in such an important policy issue. Domestically, a distributionally related management program should pay careful attention to the real mobility, both monetarily and non-monetarily, of all who seek access.(See also W79-00237 and W79-00238)
W79-00236

DISTRIBUTIONAL IMPLICATIONS OF EXTENDED FISHERIES JURISDICTION: SOME RESEARCH AND POLICY ISSUES: DISCUSSION,
Rhode Island Univ., Kingston, Dept. of Resource Economics.
D. L. Hueth, and V. J. Norton.
American Journal of Agricultural Economics, Vol. 59, No. 5, p 895-897, December 1977. 9 ref.

Descriptors: *Fisheries, *Fish management, *Distribution, *Access, *Economics, *Welfare(Economics), *Public policy, Jurisdiction, Model studies, Research priorities, Theoretical analysis, Policy, Commercial fishing, Income distribution, Economic efficiency, Social aspects, Social impact, General equilibrium models, Willingness to pay.

Bromley's 1977 paper on the distributional implications of extended fisheries jurisdiction is criticized. In general equilibrium analysis of international fisheries the interdependent production possibility curves illustrated in Bromley's Figure 1 imply that complete specialization in fisheries by both countries would produce more fish than is possible. Since the assumptions of Figure 1 are basic to Bromley's international analysis, his conclusions in that section are questionable. Two aspects of Bromley's domestic analysis also cause concern: (1) He has made important implicit distribution decisions regarding allocation within each group, without which there would be no economic rent or willingness to pay for access to the fishery. (2) His calculation of willingness to pay for access is questionable. He assumes a net present value (NPV) of access of 105 for group CF and an NPV of their best alternative of 95. It is unclear why this group would be willing to pay more than 10 for the right to fish. What Bromley calculates as the NPV for access minus the NPV for the alternative would in fact represent willingness to pay for access. Bromley seems to suggest access be allocated to the highest bidder, a procedure he questioned earlier. The difference in NPV also represents maximization of rents (or benefits) to the resources, which Bromley argues is 'nonsense'. To help determine the advantageousness of a policy, the purely ordinal general equilibrium framework should be replaced by the economic surplus framework. Research needs are listed. See also W79-00236 and W79-00238. (Lynch-Wosconsin)
W79-00237

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POLICY AND RESEARCH ISSUES IN THE FISHERY: DISCUSSION,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
R. S. Johnston, and F. J. Smith.
American Journal of Agricultural Economics, Vol. 59, No. 5, p 893-894, December 1977.

Descriptors: *Fisheries, *Fish management, *Distribution, *Access, *Economics, *Welfare(Economics), *Public policy, Jurisdiction, Model studies, Theoretical analysis, Policy, Commercial fishing, Income distribution, Economic efficiency, Social aspects, Social impact.

Two point of criticism are given on Bromley's 1977 paper on distributional implications of the extended economic zone in the fishery: (1) A clearer distinction is needed between use of welfare theory to prescribe policy (normative) and its use in predicting consequences of policy decisions (positive). (2) Whether distribution is a dimension of economic efficiency or is a separate socially relevant variable should be clarified. Bromley goes beyond identifying distributional consequences of fishery policy and suggests fishery policies on the basis of their distributional consequences. Theoretical constructs are generally used by economists to predict consequences of alternative policies, not to prescribe policy for the greatest benefit to all. Bromley should therefore clarify when he is writing as an economist and when as a manager. In regard to the second point, Bromley argues that efficiency (or maximum net economic rent) is only one socially relevant variable, but his discussion of distribution does not explain if it should be considered another socially relevant variable or a dimension of efficiency. If the former, there are many more that also deserve consideration. If the latter, distributional dimensions of other socially relevant variables must be accounted for. It is likely that commercial fishermen would rank efficiency low on a list of socially relevant variables. Greater consistency of example of the use of welfare economics is also desirable. (See also W79-00236 and W79-00237) (Lynch-Wisconsin)
W79-00238

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT,
National Marine Fisheries Service, La Jolla, CA.
D. D. Huppert.
American Journal of Agricultural Economics, Vol. 59, No. 5, p 877-882, December 1977. 17 ref.

Descriptors: *Fisheries, *Fish management, *Commercial fishing, *Economics, *Jurisdiction, *Welfare(Economics), Fish conservation, Fishery Conservation and Management Act of 1976, Income distribution, Theoretical analysis, Institutional constraints, Regulation, Economic efficiency, Political constraints, Taxes.

With extension of the U.S. fishery conservation zone to 200 miles off the Atlantic and Pacific coasts and adoption of management economic objectives in the Fishery Conservation and Management Act of 1976 (FCMA), welfare gains become important. Constraints to such gains include: (1) lack of comprehensive and unified management authority; (2) certain provisions of FCMA (e.g., restricting use of fees or landings taxes; (3) regional orientation of the fishery councils and their domination by industry spokesmen; and (4) inadequate economic knowledge of recreational fisheries. FCMA establishes conditions for im-

proved economic performance: (1) establishment of federal authority over areas broad enough to allow unified management; (2) creation of regional councils to develop management plans with industry and scientific cooperation; (3) economic criteria for fishery management plans; and (4) means to control foreign fishing harvests within the U.S. zone. Success of the management effort will depend more upon actions and attitudes of fishery councils and federal authorities than upon any rigid institutional constraints. Maximization of social welfare and economic gains will not necessarily result from such traditional biological goals as maximum sustainable physical yield; instead, consideration is needed of economic values generated by fisheries, private and social costs of fishery exploitation and management, and probable income distribution resulting from regulations. (Lynch-Wisconsin)
W79-00240

PROPERTY RULES, LIABILITY RULES, AND ENVIRONMENTAL ECONOMICS,
Wisconsin Univ.-Madison. Center for Resource Policy Studies.
D. W. Bromley.
Journal of Economic Issues, Vol. 12, No. 1, p 43-60, March 1978. 2 tab, 22 ref.

Descriptors: *Environmental economics, *Economics, *Property rights, *Liability, *Externalities, *Entitlements, Decision making, Model studies, Methodology, Classification, Policy, Theoretical analysis, Rules.

While environmental economics has fully emerged as a subdiscipline of economics, as signalled by works of Baumol and Oates (1975 and Fisher and Peterson (1976), there has been little explicit discussion of the central role of alternative assignments of property rights. Standard policy has been to internalize externalities by changing property rights and thus the scope of decision-making. This paper attempts to fill a theoretical gap with a taxonomy of entitlements (property rights) developed by Calabresi and Melamed (1972), and also suggests several important considerations in externality situations. Human interference is here regarded as multifaceted, and assumptions that transactions costs are low or zero, that only two parties are engaged in bargaining, and that there is a unique damage function are not taken for granted. Calabresi and melamed postulated three basic types of entitlements, adopted here: (1) those protected by property rules, (2) those protected by liability rules, and (3) inalienable entitlements. Five rules of entitlement are summarized in a table. It is shown that under a property rule negotiation and agreement must occur prior to an action, while under a liability rule actions with interfering aspects will occur, and compensation follows the action. In situations involving many individuals, a liability is more practical. A concluding section assesses implications for invironmental policy-making. (Lynch-Wisconsin)
W79-00241

NATURAL RESOURCE ECONOMICS: THE UPSETTING DISCIPLINE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-00242

A SOCIO-ECONOMIC APPROACH TO WATER POLLUTION LAW ENFORCEMENT IN ENGLAND AND WALES,
Newcastle-upon-Tyne Univ. (England). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-00245

THE NATIONAL WATER COMMISSION REVISITED PERSPECTIVE ON NATIONAL WATER POLICY STUDIES, WITH SOME IMPLICATIONS FOR CHANGES IN FUTURE WATER POLICY,
National Research Council, Washington, DC. Commission on Natural Resources.
T. M. Schad.
Water Resources Bulletin, Vol. 14, No. 2, p 302-312, April 1978. 6 ref.

Descriptors: *National Water Commission, *Water policy, Water conservation, Policy formulation, Government reorganization, Recommendations.

In 1973 the National Water Commission concluded its five-year study of national water policy by issuing a massive report containing over 200 recommendations for improvements in the way the Nation deals with its water resources. The Carter Administration is now engaged in another water policy review which incorporated many of the policies espoused by the National Water Commission. In this paper, which was presented at the 13th American Water Resources Conference in Tucson in November of 1977, the author describes the work of the National Water Commission and the actions taken on its recommendations. (Bell-Cornell)
W79-00383

WATER ADMINISTRATION IN ENGLAND AND WALES IMPACTS OF REORGANIZATION,
Victoria Univ. (British Columbia). Dept. of Geography.
W. R. D. Sewell, and L. R. Barr.
Water Resources Bulletin, Vol. 14, No. 2, p 337-348, April 1978. 2 fig, 3 tab.

Descriptors: *Water management(Applied), *Administration, *England, *Wales, *Legislation, *Water authorities, Reorganization, Institutions, Policy, Organizational structure, Recruitment patterns.

Water management in England and Wales has undergone a major transformation in the past three decades, and especially under the 1963 and 1973 legislation. It has witnessed a shift from local to national responsibility, an integration of functions, and a move towards the incorporation of economic principles into water policies. For some observers, the new legislation appeared to be pioneering and farsighted. There is little doubt that it has resulted in many beneficial changes. However, not all the goals have been achieved. Modification of the 1973 legislation are already in prospect. Reviewed herein are the progress to date and comments on the problems now to be faced. (Bell-Cornell)
W79-00384

MANAGEMENT ASPECTS OF CYCLIC STORAGE OF WATER IN AQUIFER SYSTEMS,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
For primary bibliographic entry see Field 4B.
W79-00386

A STUDY OF COASTAL POLLUTION AND AGENCY INTERFACE,
University of Southern Mississippi, Hattiesburg. Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W79-00389

AN ANALYSIS OF CRITICISMS OF INTERNATIONAL FISHERY ORGANIZATIONS WITH REFERENCE TO THREE AGENCIES ASSOCIATED WITH THE CANADIAN WEST COAST FISHERY,
Waterloo Univ. (Ontario). Dept. of Geography.
B. Mitchell, and H. M. Huntley.
Journal of Environmental Management, Vol. 5, No. 1, p 47-73, January 1977. 9 tab, 23 ref.

Descriptors: *Fisheries, *Canada, *Managemen *International agencies, *Criticisms, Literatu review, Research procedure, Fishing industry, E forcement, Regulation, Decision making.

This study purposed to identify weaknesses of i ternational fishery agencies and to explore the implications for management. Based upon a liter ture review, nine common criticisms of intern tional fishery organizations are identified relati to allocation of power, acceptability of recomme dations, enforcement responsibility, regulation non-member nations, flexibility, type of researc staff, generation of data, communication a public involvement. These criticisms are then e amined relative to three international agencies a sociated with the Canadian west coast fishery: t International agencies associated with the Canad an west coast fishery: the International Nor Pacific Fisheries Commission, Internation Pacific Halibut Commission, and Internation Pacific Salmon Commission. These organizatio vary in terms of structure, target species a management problems. Data were collected duri three months in the summer of 1974 by perso interviews. Respondents were selected from va ous groups within the industry. Interviews we completed with respresentatives from the intern tional fishery organizations, national governme fishery departments, provincial government age cies, fishermen, processors, and external exper The findings suggest two types of criticism: consensus exists as to the validity of the criticis but variation emerges as to whether their effec on management have positive or negative impact and (2) it is agreed that the criticisms are releva and that they have a negative effect on manag ment practices. For either category, no simp solutions exist; alternatives are available, ea having its own strong and weak points. (Bell-Co nell)
W79-00394

LOOKING AT THE POSITIVE SIDE OF ENE GY REGULATION,
Fraser Companies Ltd., Madawaska, ME.
For primary bibliographic entry see Field 3E.
W79-00411

ECONOMIC IMPACTS OF PULP AND PAPE INDUSTRY COMPLIANCE WITH ENVIRO MENTAL REGULATIONS. VOLUME I. SU MARY AND AGGREGATE INDUSTRY IMPAC ANALYSES.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-268 74 Price codes: A10 in paper copy, A01 in microfich Environmental Protection Agency, Report EP 230/3-76-014-1, 221 p, May 1977. 38 fig, 76 tab.

Descriptors: *Pulp and paper industry, *Econom impact, *Environment, *Protection, Water poll tion control, Air pollution, Economics, Cost Water pollution sources, Legislation, Regulatio Econometrics, Pollution abatement, Prices, D mand, Financing, Foreign trade, Import, Expo Noise, Legal compliance.

This report estimates the potential economic i pacts that would result from the pulp and paper i dustry's compliance with the following existing proposed environmental regulations: water (tho issued by the EPA for existing and new capacity air (those issued by states for the existing indust and those issued by the EPA for new capacity; a noise (those issued by OSHA). The analysis do not include costs or impacts associated with ti berlands or paper/paperboard converting oper tions (except wher converting is done at the pap mill). The impacts of complying with these regul tions on paper prices and demand, short-ter capacity constraints, secondary impacts on su pliers, mill closures, external financing requi ments, and balance of trade (imports/exports) a discussed. Econometric analysis was used to es

e demand and supply curves for the major duct sectors, and the economics of model mills used to assess closures and long-term prices. inancial funds flow model is developed to esti- e cash flow requirements for growth and en- nmental costs. (Witt-IPC)
9-00430

. Nonstructural Alternatives

TER AND LAND RESOURCE ACCOM- SHMENTS 1975. SUMMARY REPORT.
eau of Reclamation, Washington, DC. nomics and Program Analysis Branch.
primary bibliographic entry see Field 3F.
9-00191

. Ecologic Impact Of Water Development

VIRONMENTAL MANAGEMENT STRATE- FOR THE GREAT LAKES SYSTEM.
rnational Reference Group on Great Lakes lution from Land Use Activities.
primary bibliographic entry see Field 5G.
9-00084

SEARCH TO ANTICIPATE ENVIRONMEN- L IMPACTS OF CHANGING RESOURCE AGE.
nford Research Inst., Menlo Park, CA.
ilable from the National Technical Informa- Service, Springfield, VA 22161 as PB-256 293, e codes: A12 in paper copy, A01 in microfiche. ort EPA-600/9-76-022. Proceedings of Sym- ium held August 27-28, 1975, Menlo Park, ifornia, April 1976. 276 p. Moll, K. D., Editor. 01-2940 No. 17.

criptors: *Resources development, *Ecology, vironmental effects, *Conferences, *Research rities, Environmental engineering, Systems lysis, Natural resources, Resources, Social nge, Socio-environmental research assess- nts, Environmental control.

rteen papers by authorities from government, demia, industry, and other institutions are pro- d that deal with research and policy problems ng the Environmental Protection Agency from nt and prospective changes in availability of h natural resources as energy, minerals, cultural land, and clean air and water. One im- tant aspect examined is the complex nature of ractions among resources, environment, and ial values and the need for research on patterns uch interactions. Also discussed is the need for eased research in areas, such as patterns of urce flow and usage, economic and social in- tives for controlling the environment, and on rging potentially critical ecological problems. ers focus on environmental monitoring and as- sment techniques and specific applied research technology development programs. (Majtenyi-
)
9-00085

ERGY CONSERVATION AND OUTDOOR CREATION,
itage Conservation and Recreation Service, shington, DC.
. Bever, and F. P. Dodd.
8 Nationwide Outdoor Recreation Plan, Task ce Report. 24 p, 4 tab, 18 ref.

criptors: *Recreation, *Energy, *Energy con- vation, *Energy consumption, Recreation lities, Transportation, Tourism, Social ects, Scenic highways, Recreation demand, reational vehicles, National parks, Local ks.

How the supply and price of energy affects recreation, and how recreation can conserve energy resources is explained. Recreation involves consumption of energy in a variety of indirect ways, such as maufacture of recreational goods, and maintenance of recreational facilities and associated business, such as gas stations, hotels, and restaurants. A more direct use of energy is the fuel consumption needed to travel to recreational areas and fuel consumed by recreational vehicles. Such consumption is expected to increase steadily at a rate of 3% a year. One suggested method for conserving such energy is development of more efficient automobile engines but this will not aid those who cannot afford to buy a new, more efficient vehicle. An alternative is to encourage use of mass transit facilities where they exist by providing better information on availability, improved scheduling, and more frequent service. Another approach is to develop new recreational areas closer on recreation is discussed, with emphasis on rising gasoline prices and its predicted effect on travel. Although travel to National parks did decline 13% during the 1973-1974 oil crises, it is difficult to project the effect of slow, regular price increases expected over the next 5 to 10 years. Included are a list of areas for further research and a summary of policy questions which will have to be addressed in the near future. (Majtenyi-IPA)
W79-00096

NEEDS OF PRIVATE FOR PROFIT ENTERPRISES IN OUTDOOR RECREATION.
Heritage Conservation and Recreation Service, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-00097

FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II,
American Museum of Natural History, Placid, FL. Archbold Biological Station.
For primary bibliographic entry see Field 5C.
W79-00100

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6B.
W79-00142

IMPACTS OF IMPOUNDMENT TO VERTEBRATE ANIMALS AND THEIR HABITATS IN THE SNAKE RIVER CANYON, WASHINGTON,
Washington State Univ., Pullman. Dept. of Zoology.
R. E. Lewke, and I. O. Buss.
Northwest Science, Vol. 51, No. 4, p 219-270, 1977, 18 fig, 19 tab, 62 ref. OWRT-A-054-WASH(3).

Descriptors: *Impoundment impacts, Above-pool habitats, Below-pool habitats, Floodplains, Lower Granite area(Wash), Wildlife, *Washington, Environmental effects.

Impoundment by Lower Granite Dam on the Snake River inundated 1,319 ha of wildlife habitat; 210 ha represented tree-shrub riparian habitat and 1,109 ha represented weedy-floodplain habitat. These habitat were of paramount importance to wildlife, particularly in winter. Sixty-five of 129 species studied were significantly dependent upon tree-shrub riparian habitat. Thirty-four species were significantly dependent upon riverbank-floodplain habitat. Birds forced from these habitats by inundation will not be able to re-establish themselves in remaining above-pool habitats which were filled to capacity before impoundment occurred. Furthermore, the loss of below-pool habitats will indirectly cause a decrease in the number of birds remaining in above-pool habitats. The greater a species' dependence on tree-shrub riparian or riverbank-floodplain habitat, the greater the impact of impoundment on that species. Impoundment is estimated to cause a loss locally of nearly 14,000 birds in summer and over 30,000 birds in winter. Migrant birds did not utilize the lower Snake River Canyon habitats to a great degree, and thus will not be affected as much as resident birds. Since vertebrate species will be affected differently by habitat loss, population density will decline disproportionately. Some species will be forced completely from the area. All upland game birds will decrease after impoundment; Ring-necked Pheasants will be reduced the most because of this species' strong dependence upon the floodplain. Although Chukar partridge populations declined 46 percent from 1972 to 1973, this upland game bird will very probably maintain relatively high population densities in future years. The overall impact to vertebrates will be a high loss in numbers and a decrease in diversity. Opportunities for management in the area of Lower Granite Reservoir are very limited. The most productive soils are now inundated, and only shallow rocky soils extend above pool level. These shallow soils will not support high quality riparian and floodplain habitats, thus resulting in a permanently reduced and simplified vertebrate fauna.
W79-00146

SUMMARY OF STUDY FINDINGS, PHASE I REPORT: ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 4C.
W79-00195

VEGETATION OF SOUTHEASTERN FLORIDA -- PARTS II - V,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W79-00196

WETLANDS AS A NAVAL ENVIRONMENTAL CONCERN,
Naval Academy, Annapolis, MD. Dept. of Political Science.
C. L. Cochran.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 360, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-24, Energy-Environment Study Group, U. S. Naval Academy, May, 1975. 14 p.

Descriptors: *Wetlands, *Census, *Military reservations, Data collections, Planning, Environment, Environmental effects.

Currently the Navy lacks basic numbers in terms of wetland acreage, miles of shoreline, much less a complete study of what it owns. It was intended that a data bank would be developed with this information, that could be used for storing and retrieving the data, which would be Navy oriented. Events such as oil spills, noise studies, and other information could be used as a device to identify potential pollution sources or problems for naval installations. (Steiner-Mass)
W79-00201

ON THE ENVIRONMENTAL EFFICIENCY OF ECONOMIC SYSTEMS,
Pennsylvania State Univ., University Park.
R. J. McIntyre, and J. R. Thornton.
Soviet Studies, Vol 30, No 2, p 173-192, April 1978. 1 tab.

Descriptors: Economics, *Environmental effects, *Methodology, *Environmental convergence, *Soviet Union, *United States, *Pollution abatement, Public policy, Political aspects, Central planning, Institutions, Incentives, Air pollution, Water pollution control, Legislation, Regulation, Pollutants, Gross national product, Theoretical analysis.

Evaluation of environmental efforts and policies of the Soviet Union, and comparison with similar data for the United States, demonstrates that environmental convergence theories are inconsistent with evidence and are methodologically incorrect. Such theories hold that environmental disruption will tend to be uniform among countries at similar levels of economic development regardless of national political or institutional form. It is shown that data limitations and methodological difficulties which invalidate these theories also render ambiguous any empirical comparison of the overall environmental performance of two economies. In consequence, comparisons must be restricted to evaluations of the appropriateness of institutional forms and incentive structures which determine environmental performance. It is claimed that a centrally planned economy has built-in informational advantages that should make it more environmentally efficient. Evidence also suggests that Soviet implementation of abatement programs has been substantial, contrary to the implications of convergence theorists. The methodology of environmental convergence theorists is invalid because in appraising a country's environmental record, it fails to distinguish between the amount of environmental disruption in an economy and the environmental efficiency of an economic system. (Lynch-Wisconsin)
W79-00230

CONCEPTUAL AND STATISTICAL ISSUES IN DEVELOPING ENVIRONMENTAL MEASURES - RECENT U.S. EXPERIENCE,
Bureau of Economic Analysis, Washington, DC.
J. E. Cremeans.
The Review of Income and Wealth, No 2, p 97-115, June 1977. 1 tab.

Descriptors: *United States, *Estimating, *Cost-benefit analysis, *Pollution abatement, *Methodology, *Costs, *Public policy, Benefits, Statistical methods, Economics, Water pollution control, Air pollution, Decision making, Expenditures, Administration, Bureau of Economic Analysis.

Methods used by the Bureau of Economic Analysis (U.S. Department of Commerce) in estimating public and private spending for pollution abatement and control (PAC) are described. In 1972 the federal government began work on this project to assess costs and benefits of pollution abatement and control. Work since the project started in 1972 has been limited to: (1) pollution from harmful foreign substances, and (2) forms of energy discharged in production, distribution, and consumption. Estimates so far have dealt only with pollution costs, but evaluation of benefits of abatement and control also is scheduled. PAC concepts and definitions were designed to be compatible with national income accounts. The following terms are defined: pollution, pollution abatement, direct pollution abatement cost, indirect pollution abatement cost, and indirect benefits. A framework for presenting the data is developed, and expenditures for 1972 and 1973 are given. Total national expenditures for PAC were $19.5 billion in 1972 and $23 billion in 1973. These totals are broken down by air, water, and solid waste pollution. Estimates are also subdivided by administrative components: pollution abatement (personal consumption, business, and government), regulation and monitoring, and research and development. Each component is further subdivided. (Lynch-Wisconsin)
W79-00232

VEGETATIVE STABILIZATION OF DREDGE SPOIL IN NORTH FLORIDA,
Florida A and M Univ., Tallahassee.
For primary bibliographic entry see Field 5G.
W79-00337

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES TUNNEL SYSTEM.
Booz-Allen Applied Research, Bethesda, MD.
For primary bibliographic entry see Field 5D.
W79-00465

7. RESOURCES DATA

7B. Data Acquisition

DETERMINATION OF TERRESTRIAL ALBEDO FROM LANDSAT I SATELLITE IMAGERY IN PHOTOGRAPHIC FORM,
Arizona Water Resources Research Center, Tucson.
J. Ben-Asher.
Soil Science Society of America Journal, Vol. 41, p 835-838 1977. 2 fig, 3 tab, 9 ref. OWRT A-069-ARIZ(2), 14-34-0001-6003.

Descriptors: Remote sensing, *Albedo, Arizona, *Sonoita Creek basin(Ariz), *Photography, *Radiometry, Data collections, Soil reflectance, *LANDSAT I imagery.

Satellite imagery taken from LANDSAT I were used to determine terrestrial albedo and its changes with location and season in the basin of Sonoita Creek (31 degrees 45' N 110 degrees 43' W). A simple linear equation was derived to link the albedo with the optical density of the imagery. The modeling approach was based on the cyclic nature of the energy exchange between earth and space on the one hand and on the local density on the developed film as an output on the other hand. The results showed acceptable agreement between photographic and radiometric method for albedo determination.
W79-00012

REMOTE WATER MONITORING SYSTEM,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
D. C. Grana, and D. P. Haynes.
U.S. Patent No. 4,089,209, 10 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 844, May 16, 1978.

Descriptors: *Patents, *Monitoring, *Sampling, Data collections, *Remote sensing, Floating, Data transmission, Electrochemical analysis.

A remote water monitoring system is described that integrates the functions of sampling, sample preservation, sample analysis, data transmission and remote operation. The system employs a floating buoy carrying an antenna connected by lines to one or more sampling units containing several sample chambers. Receipt of a command signal actuates a solenoid to open an intake valve outward from the sampling unit and communicates the water sample to an identifiable sample chamber. Such response to each signal receipt is repeated until all sample chambers are filled in a sample unit. Each sample taken is analyzed by an electrochemical sensor for a specific property and the data obtained is transmitted to a remote sending and receiving station. Thereafter, the samples remain isolated in the sample chambers unitl the sampling unit is recovered and the samples removed for further laboratory analysis. (Sinha-OEIS)
W79-00047

NONMETALLIC ELECTROFISHING BOOMS AND ACCESSORY TACKLE,
Fish and Wildlife Service, Arkadelphia, AR.
T. O. Duncan.
The Progressive Fish Culturist, 1978, Vol. 40(3), p 98-100. 1 tab, 3 fig, 6 ref.

Descriptors: On-site investigations, Laboratory equipment, *Zooplankton, Methodology, *Trawling, *Sampling, *Freshwater fish, Fish attractants, Fishing gear, *Electrofishing, Fish populations, Non-metallic electrofishing booms.

The original strength and flexibility of nonmetallic (nonconducting) electrofishing booms were maintained by building special tackle from which to hang the electrodes and to suspend the boom above the water. The booms and tackle functioned well in field operations, and since the booms are nonconducting, they reduce the potential hazard associated with electrofishing equipment. Epoxy resin poles filled with polyurethane foam were used instead of dimensional lumber, wooden dowels, hollow fiber glass poles, or aluminum tubing wrapped in fiber glass. (EIS-Katz)
W79-00069

COLLECTION BUCKET FOR USE WITH TOW NETS FOR LARVAL FISH,
Fish and Wildlife Service, Arkadelphia, AR.
T. O. Duncan.
The Progressive Fish Culturist, 1978, Vol. 40(3), p 118-119. 1 fig, 1 tab, 7 ref.

Descriptors: Methodology, *Monitoring, *Sampling, *Freshwater fish, Larvae, *Larval growth stages, Laboratory equipment, On-site investigations, Zooplankton, Juvenile fish, Nets, Trawling, *Fish populations, Collection buckets, Tow net, Trawls.

A collection bucket is described for use with tow nets used to sample larval fish. The contoured bottom prevents organisms from lodging in corners when the bucket is emptied. Organisms can be washed off the bolting cloth with a wash bottle from the outside. (EIS-Katz)
W79-00070

SIMPLE VENTURI DEVICE FOR MIXING FRESHWATER AND SEAWATER IN AN ESTUARINE CULTURE SYSTEM,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Fisheries Lab.
W. R. Heard, and F. H. Salter.
The Progressive Fish Culturist, Vol. 40(3), July 1978, p 101-113. 1 tab, 1 fig, 4 ref.

Descriptors: *Aquaculture, Methodology, Freshwater, Sea water, *Laboratory equipment, *Bioassays, Salinity, Alaska, Laboratory tests, Estuaries, *Little Port Walter(Ala), Venturi injected seawater.

A venturi device made from standard sizes of polyvinyl chloride plumbing and rod-stock material was tested at Little Port Walter, an estuary in southeastern Alaska. When installed in a gravity fed freshwater delivery system, the venturi injected seawater into the discharge water to produce a stabe water flow of intermediate salinity. The use of interchangeable components with different-sized openings permits regulation of the salinity of the discharge water. (EIS-Katz)
W79-00071

QUANTITATIVE COMPARISON OF SEINING AND UNDERWATER OBSERVATION FOR STREAM FISHERY SURVEYS,
Argonne Natonal Lab. IL.
R. M. Goldstein.
The Progressive Fish Culturist, Vol. 40(3), 1978, p 108-111. 2 tab, 1 fig, 8 ref.

criptors: *Sampling, *Freshwater fish, *On- investigations, Methodology, *Swimming, rveys, Nets, Monitoring, Fish populations, ing gear, Connecticut, Species occurrence, tive abundance, Snorkel dives, *Snorkel sur- *Seine survey, Hop River, Shetucket River, haug River.

cies occurrence and relative abundance, as rmined by direct observation (by snorkel rs) and by seine survey, were compared. Oc- ence was compared for a single snorkel survey ollections made during 1 year, 3 months, and 1 At least as many species (and usually many e individuals) were identified during the snor- survey as during the seine survey: however, all species were identified by both methods. cies relative abundance, as judged by seine ections, may be biased toward the smaller spe- (EIS-Katz)
-00072

TIFICIAL SUBSTRATE SAMPLER FOR THIC INVERTEBRATES IN PONDS, LL LAKES, AND RESERVOIRS,
nessee Technological Univ., Cookville. Dept. iology.
Kathman.
Progressive Fish Culturist 1978, Vol. 40(3), 1978, p 114-115. 2 fig, 4 ref.

criptors: Methodology, *On-site investiga- s, *Benthos, Ponds, Reservoirs, Lakes, ertebrates, Animal populations, *Sampling, ficial substrate sampler, Benthic inver- ates.

rtificial substrate for benthic invertebrate sur- is described. Organism wash-off during sam- retrieval is prevented by enclosing the basket polyester fabric skirt before raising it. (EIS- z)
-00074

LICATIONS OF REMOTE SENSING TO ROLOGIC PLANNING,
Systems International, Inc., Gambrills, MD.
oats, Jr., T. Fowler, and P. Castruccio.
ilable from the National Technical Informa- Service, Springfield, VA 22161 as NASA-CR- , Price codes: A07 in paper copy, A01 in ofiche. Report No. NASA Contractor Report , August 1978. 138 p, 29 fig, 18 tab, 2 append. 58-32423.

criptors: *Remote sensing, *Hydrologic data, er resources, *Water pollution, ellites(Artificial), *LANDSAT, Surveys, ersheds(Basins), Planning, Model studies, ns, Sub-basins, Land classification, Magothy r, Water pollution sources, Runoff, Rainfall- off relationships.

monstration project illustrates the usefulness accuracy of data obtained by remote sensing nology associated with the LANDSAT earth urces satellite in the field of water resources, cially on estimation of non-point source pollu- loads. LANDSAT images were used to classi- nd cover using optical analysis of multi-band, i-temporal images. Classification accuracies hree small test watersheds were above 95%. a fourth watershed, the Magothy River in yland, land cover was converted to pollutant s using coefficients relating significant pollu- to land use and storm runoff volume. These were subsequently processed by the systems Hydrologic Simulator model which lated runoff from average expected rainfall. yielded an estimate of monthly expected pol- ts loads for the 17 sub-basins of the Magothy rshed. Resuls were used by the Baltimore Re- al Planning Council for its 208 area-wide waste r plan and the Council has indicated that these niques are preferred for other watersheds in egion. (Majtenyi-IPA)
-00099

SOLID STATE EVENT RECORDER FOR RAINFALL MEASUREMENT,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2B.
W79-00125

HAILSTONE SIZE INFERRED FROM DENTS IN COLD-ROLLED ALUMINUM SHEET,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
D. V. D. S. Roos.
Journal of Applied Meteorology, Vol. 17, No. 8, p 1234-1239, August 1978. 7 fig, 2 tab, 7 ref.

Descriptors: *Hail, *Measurement, *Particle size, Analytical techniques, Aluminum, Precipitation(Atmospheric), Weather, Cloud physics, Storms, Mathematical studies, Meteorology, Hailstones, Hailstones size.

The reflecting properties of microscopic corrugations on the surface of cold-rolled aluminum sheet used in hailpads led to a new technique for determining the size of hailstones. Hailstone models of various shapes and sizes were used to produce dents in the sheet, for normal and oblique impacts. It was found that psi, the diameter (or equivalent spherical diameter) of hailstones, was related to mean d, the diameter of the characteristic shadow inside dents, such that psi = 0.6 mean d + 3 (for psi between 4 and 40 mm). The standard deviation of psi (for normal impacts) was found to be + or - 8% for spheres of psi = 6 mm, + or - 5% for spheres of psi greater than 11 mm and between approximately + or - 6 and + or - 17% for nonspherical objects. Also, the value of mean d for nonspherical objects that impacted at angles of up to 50 deg was only about 10% larger than the corresponding value of mean d if the impact had been normal. An estimate of the kinetic energy of an impacting hailstone may be made from d. This method proved to be particularly suitable for recording actual hailfalls, and results thus obtained are discussed. (Sims-ISWS)
W79-00139

THE VERTICAL PLANAR MOTION MECHANISM; A DYNAMIC TEST APPARATUS FOR EVALUATING CURRENT METERS AND OTHER MARINE INSTRUMENTATION,
National Ocean Survey, Rockville, MD.
A. N. Kalvaitis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 571, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/7-78-145, July 1978. 37 p, 7 fig, 2 tab, 4 append. EAP-78-BEA.

Descriptors: *Flow measurement, *Flowmeters, *Hydraulic design, *Hydraulic models, Fluid mechanics, Dynamics, Currents, Vertical Planar Motion Mechanism(VPMM), Flow, Dynamics, Hydraulic machinery, Instrumentation.

To aid in evaluating accuracy of current meters and other marine instruments, a dynamic test apparatus called a Vertical Planar Motion Mechanism (VPMM) was developed which is capable of generating three major modes, vertical-circular, vertical, and horizontal. Length scales range from 0.15 to 1.22 m and time scales vary from 5 to 12 seconds. The VPMM is mounted on a tow carriage which provides the steady velocity while the apparatus itself superimposes oscillatory motions on full-size current meters. The VPMM is instrumented so that the instantaneous velocities of the test sensors and their outputs may be measured at a 20-Hz sampling rate, and an on-board computer allows for near-real time data analysis. The development and wet acceptance testing of the VPMM is described using several types of current sensors, including electromagnetic and acoustic varieties. Performance of the apparatus was judged acceptable for all conditions investigated and no deleterious interactions were noted between it and the test instruments. The VPMM provides a unique capability for testing and evaluating sensors at various combinations of length and time scale dynamics. Other anticipated uses for the VPMM include testing wave measurement systems, validating dynamic response models, and conducting stability tests on towed vehicles. (Majtenyi-IPA)
W79-00224

REMOTE MONITORING OF COAL STRIP MINE REHABILITATION,
National Aeronautics and Space Administration, Slidell, LA. Earth Resources Lab.
For primary bibliographic entry see Field 5G.
W79-00226

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS,
Harbor Branch Foundation, Inc., Fort Pierce, FL.
For primary bibliographic entry see Field 5A.
W79-00325

ELECTRIC RAINFALL INTENSITY SENSOR,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W79-00329

SHUNT METERS WITH SEGMENTAL ORIFICES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W79-00335

AGRICULTURAL AND HYDROLOGICAL APPLICATIONS OF RADAR: FINAL REPORT,
Kansas Univ. Space Technology Center, Lawrence. Remote Sensing Lab.
F. T. Ulaby.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-12243, Price codes: A05 in paper copy, A01 in microfiche. Technical Report 177-62, July 31, 1976. 90 p, 2 append. NASA NAS9-10261.

Descriptors: *Remote sensing, *Radar, *Bibliographies, Data processing, Application methods, Equipment, Instrumentation, Geology, Agriculture, Forestry, Hydrology, Soils, Soil types, Soil moisture, Snow, Oceanography, Abstracts, Publications, Documentation.

This was the final report of the research performed under NASA contract NAS 9-10261 covering the period 15 August 1969 to 31 July 1976. During the initial disciplines and activities in radar remote sensing, including radar systems development and analysis, data processing and display, and data interpretation in geology, geography, and oceanography. Between 1972 and the termination date of the contract, the research was focused on the evaluation of radar remote sensing applications in hydrology and agriculture based on data acquired with the Microwave Active Spectrometer (MAS) system. Due to the large volume of information generated under this contract, the titles of the reports summarizing the work were grouped by subjects. Radar remote sensing was divided into three major areas of activity: (1) Radar System Studies, (2) Data Processing and Display, and (3) Geoscience Applications. Each area was subdivided on the basis of specialization within that area. Appendix A contained abstracts of all 62 technical reports generated under this contract. Appendix B contained a sequential list of the titles of these reports. (Sims-ISWS)
W79-00464

SIMPLE SAMPLER ACTIVATION AND RECORDING SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
F. A. Koehler, F. J. Humenik, E. P. Harris, and J. C. Barker.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE5, Technical Note, p 1032-1035, October 1978. 3 fig, 1 ref, 1 append. EPA R803328.

Descriptors: *Water sampling, *Instrumentation, *Automation, *Control systems, Sampling, Streamflow, Hydrology, Hydrographs, Automatic control, Research equipment, Water measurement, Sampling activation, Recording systems.

A simple sampler activating device that resulted in automated sample procurement and simultaneous hydrograph time-stage notation was developed as part of a project to assess the impact of rural nonpoint sources on an areawide basis. The total instrumentation for continuous gaging and automated sampling was battery operated because sampling sites were in rural areas. The sampler selected (ISCO Model 1392, Instrumentation Specialities Company, Lincoln, Nebraska) may be activated on a time or flow basis, and the actual sampling interval can be a multiple (up to 12) of the primary interval. A continuous analog state record was obtained using a Freiz Model AU stage recorder. Results of 18 months of field use have been favorable. Significant improvements that have accrued from the use of this system as opposed to time interval sampling are: (1) samples are taken in response to hydrologic changes in the stream, when greatest changes in stream chemistry are expected; (2) repetitive samples under steady-state flow conditions are eliminated, reducing the analytical laboratory workload; (3) streamflow and water chemistry are measured concurrently, allowing more precise calculation of constituent transport; (4) no prior knowledge or assumptions of the hydrologic response time of the stream is necessary in order to adequately characterize a runoff event; and (5) all streamflow regimes are sampled, small and large runoff events as well as baseflow recession, in proportion to the expected changes in water chemistry. (Humphreys-ISWS)
W79-00480

7C. Evaluation, Processing and Publication

WASOPT USERS MANUAL: AN INTEGER PROGRAMMING METHODOLOGY FOR MUNICIPAL/REGIONAL WATER SUPPLY PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W79-00002

A TECHNIQUE FOR ESTIMATING CLOCK TWO-HOURLY PRECIPITATION RATE DISTRIBUTIONS,
Air Force Environmental Technical Applications Center, Scott AFB, IL.
For primary bibliographic entry see Field 2B.
W79-00089

APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC PLANNING,
ECOsystems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W79-00099

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX B,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00189

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY. APPENDIX C,
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00190

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX I.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00192

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX III--PROJECT DATA.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00194

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.
Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Management.
For primary bibliographic entry see Field 5G.
W79-00222

REMOTE MONITORING OF COAL STRIP MINE REHABILITATION,
National Aeronautics and Space Administration, Slidell, LA. Earth Resources Lab.
For primary bibliographic entry see Field 5G.
W79-00226

YELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969.
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W79-00250

MAPS SHOWING WATER-LEVEL DECLINES, LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.; and Bureau of Reclamation, Phoenix, AZ. Arizona Dept. of Transportation, Phoenix.
R. L. Laney, R. H. Raymond, and C. C. Winikka.
Water-Resources Investigations 78-83 (open-file report), June 1978. 2 sheets, 20 ref.

Descriptors: *Groundwater, *Overdraft, *Water level fluctuations, *Land subsidence, *Fissures(Geologic), Maps, Aquifers, Water wells, Pumping, Drawdown, Land use, Water demand, Urbanization, Evaluation, *Arizona, Pinal County, Maricopa County.

From 1915 to 1975, more than 109 million acre-feet of ground water was withdrawn from about 4,500 square miles in Pinal and Maricopa Counties in south-central Arizona. The volume of water withdrawn greatly exceeds the volume of natural recharge, and water levels have been declining since 1923. As a result of the water-level declines, the land surface has subsided, the alluvial deposits have been subjected to stress, and earth fissures have developed. Land subsidence and earth fissures have damaged public and private properties. Subsidence and fissures will continue to occur as long as ground water is being mined and water levels continue to decline. As urban development expands, land subsidence and earth fissures will have an increasing socioeconomic impact. Information on maps includes change in water levels, measurements of land subsidence, and location of earth fissures. A section showing land subsidenc between Casa Grande and the Picacho Peak I terchange also is included. Scale 1:250,00 (Woodard-USGS)
W79-00251

GROUNDWATER QUALITY ATLAS O NEBRASKA,
Geological Survey, Lincoln, NE. Water Resourc Div.; and Nebraska Univ. Conservation and Su vey Division, Lincoln.
R. A. Engberg, and R. F. Spalding.
Nebraska Conservation and Survey Divisio University of Nebraska: Resource Atlas No. 1978. 39 p, 20 fig, 1 tab, 32 ref.

Descriptors: *Water quality, *Groundwate *Nebraska, *Maps, *Chemical analysis, Samplin Sites, Aquifer management, Geochemistr Chemical reactions, Water analysis, Dissolv solids, Alkalinity, Hardness(Water), Sodiu Potassium, Sulfates, Chlorides, Fluorides, Boro Silica, Iron, Manganese, Phosphorus, Nitrate Trace elements, Selenium.

This atlas contains a series of maps describing t chemical quality of the ground water of Nebrask Each map depicts the quality of water in only t principal aquifer in each area of the State; no tempt was made to differentiate water from d ferent geologic sources. Maps showing zones concentration of 13 chemical constituent or co binations of constituents are presented along wi accompanying maps of sampling sites. The 13 co stituents are dissolved solids, hardness as CaCO sodium plus potassium, alkalinity as CaCO sulfate, chloride, fluoride, silica, boron, iro manganese, selenium, and phosphorus. A m showing constituent sampling-site maps presented for the trace constituents arsenic, ca mium, chromium (hexavalent), copper, lea silver, and zinc. Another map shows nitrate sa pling sites and two areas where ground water co tains high-nitrate concentrations. Descripti matter concerning source and occurrence of ea constituent is included on pages facing the respe tive maps. Short descriptions of each of 13 u derground-water areas also are given. (Woodar USGS)
W79-00252

GROUND-WATER DATA, 1974-76, INDIA WELLS VALLEY, KERN, INYO, AND SA BERNARDINO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, CA. Wat Resources Div.
C. E. Lamb, and D. J. Downing.
Open-file report 78-335, July 1978. 42 p, 3 fig, plate, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Wat wells, *Pumping, *Water yield, *Water leve Water quality, Data collections, Water level flu tuations, California, *Indian Wells Valley, *Ke County, *Inyo County, *San Bernardino County

Water-level measurements were made annually 115 wells in Indian Wells Valley, Kern, Inyo, a San Bernardino Counties, Calif., in 1974-76. In t Inyokern area the average water-level decline w 2.0 ft for two wells between October 1973 a November 1976. In the intermediate area t average decline was 6.2 ft for five wells betwe October 1973 and December 1976. In t Ridgecrest area the average decline was 4.5 ft f four wells between October 1973 and Decemb 1976 but was 10.3 ft for one well during the sa period. Reported metered ground-water pumpa from Indian Wells Valley totaled 14,400 acre-ft 1974, 14,500 acre-ft in 1975, and 14,100 acre-ft 1976. These figures may not completely reflect t total pumpage from the basin due to changing p terns of land use and new pumping source Chemical analyses were made of 102 water sa ples collected from 42 wells during 1974-76. T analyses show large variance of quality of grou water in Indian Wells Valley. (Woodard-USGS)

-00253

DROGEOLOGIC RECONNAISSANCE OF E MEKONG DELTA IN SOUTH VIETNAM D CAMBODIA,
logical Survey, Hartford, CT. Water ources Div.
. Anderson.
ilable from the Supt. of Documents, GPO, hington, DC 20402, Price $2.50. Water-Supply er 1608-R, 1978. 24 p, 3 fig, 3 plates, 7 ref.

criptors: *Available water, *Surface waters, oundwater resources, *Water quality, rology, Hydrogeology, Aquifer charac-tics, Test wells, Hydrologic data, Maps, luation, Foreign countries, *South Vietnam, mbodia, *Mekong Delta.

report describes the general hydrogeology of Mekong Delta and the adjacent region in South nam and Cambodia, summarizes the results of oratory wells in the delta from depths of 50 to meters, and the general availability of ground r for rural and municipal water supply in the nh (province) region of the delta in South nam. The ground-water conditions in five s of the Mekong Delta are described. Included descriptions of the hydrologic features and ogic setting of the Mekong Delta and adjacent on, the aquifers in the deltaic alluvial complex, the quality and quantity of water available individual aquifers. (Woodard-USGS)
-00255

OUND-WATER LEVELS IN WYOMING,
,
. Stevens.
n-file report 78-605, 1978. 203 p, 21 fig, 6 ref.

criptors: *Groundwater, *Water levels, oming, *Observation wells, *Water level fluc-ons, Hydrographs, Sites.

ind-water levels are measured periodically in etwork of about 290 observation wells in ming to record changes in ground-water ge. The areas of water-level observation are ly where ground water is used in large quanti-for irrigation or municipal purposes. This re-contains maps showing location of observa-wells and water-level changes from 1977 to . Well history, highest and lowest water s, and hydrographs for most wells are also in-ed. (Woodard-USGS)
-00259

ER RESOURCES DATA FOR PENNSYL-IA, WATER YEAR 1977--VOLUME 2. QUEHANNA AND POTOMAC RIVER INS.
ogical Survey, Harrisburg, PA. Water urces Div.
lable from the National Technical Informa-Service, Springfield, VA 22161 as PB-285 754, codes: A17 in paper copy, A01 in microfiche. r-Data Report PA-77-2, June 1978. 384 p, 7 tab.

riptors: *Pennsylvania, *Hydrologic data, face waters, *Groundwater, *Water quality, g stations, Streamflow, Flow rates, Sedi-transport, Water analysis, Water tempera-Chemical analysis, Lakes, Reservoirs, Water , Water levels, Data collections, Sites, quehanna River basin, *Potomac River basin.

r resources data for the 1977 water year for sylvania consist of records of stage, arge, and water quality of streams; stage, nts, and water quality of lakes and reser-and water levels and water quality of ground . This report, volume 2 (Susquehanna and nac River basins), contains discharge records 6 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 36 gaging stations, 8 partial-record stations, and water levels for 32 observation wells. Also included are 24 crest-stage partial-record stations and 48 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS)
W79-00265

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 880, Price codes: A16 in paper copy, A01 in microfiche. Water-Data Report PA-77-1, June 1978. 367 p, 12 fig, 4 tab.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Delaware River basin.

Water resources data for the 1977 water year for Pennsylvania consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, volume 1 (Delaware River basin), contains discharge records for 82 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 34 gaging stations, 41 partial-record stations, and water levels for 16 observation wells. Also included are 42 crest-stage partial-record stations and 38 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS)
W79-00266

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1977.
Geological Survey, Madison, WI. Water Resources Div.
Water-Data Report WI-77-1, May 1978. 626 p, 13 fig.

Descriptors: *Wisconsin, *Hydrologic data, *Surface water, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Wisconsin include records of streamflow at gaging stations, partial-record stations, and miscellaneous sites; records of reservoir storage, records of chemical, physical and biological characteristics of surface water, ground water, and precipitation, and records of water levels in observation wells. Records for a few gaging stations in bordering States also are included. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Wisconsin. (Woodard-USGS)
W79-00267

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1977--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
Water-Data Report PA-77-3, June 1978. 272 p, 6 fig.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Ohio River basin, *St. Lawrence River basin.

Water resources data for the 1977 water year for Pennsylvania consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, volume 3 (Ohio River and St. Lawrence River basins), for 96 gaging stations; stage and contents for 22 lakes and reservoirs; water quality for 13 gaging stations and water levels for 20 observation wells. Also included are 12 crest-stage partial-record stations and 27 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS)
W79-00268

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF CUSTER AND FREMONT COUNTIES, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-00274

POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT AND VICINITY, FLORIDA, SEPTEMBER, 1977,
Geological Survey, Orlando, FL. Water Resources Div.
F. A. Watkins, C. P. Laughlin, and E. C. Hayes.
Water-Resources Investigations 78-69 (open-file report), 1978. 1 sheet.

Descriptors: *Groundwater, *Potentiometric level, *Wet seasons, *Maps, *Hydrogeology, Aquifers, Florida, *St. Johns River Water Management.

This map presents the potentiometric surface of the Floridan aquifer in the St. Johns River Water Management District and vicinity for September 1977. The Floridan aquifer is the principal source of potable water in the area. Water-level measurements were made on approximately 900 wells and springs. The potentiometric surface is shown by 5-foot contours except in the Fernandina Beach area where 10- and 20-foot contours are used to show the deep cone of depression. This is the first map covering the entire St. Johns River Water Management District and vicinity for September, a high water-level period. The potentiometric surface ranged from 130 feet above mean sea level in Polk County to 131 feet below sea level in Nassau County. (Woodard-USGS)
W79-00275

SPECIES DIVERSITY INDICES OF THE FISH POPULATIONS OF STREAMS DRAINING SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION FLORIDA,
Air Force Armament Lab., Eglin AFB., FL.
R. C. Crews.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-035 592, Price codes: A03 in paper copy, A01 in microfiche. Report AFATL-TR-76-145, 50 p, December 1976. 25 fig, 2 tab, 6 ref, append.

Descriptors: *Darters, *Streams, Fish populations, Freshwater fish, Habitats, Aquatic environment, Aquatic populations, Statistical methods, Mathematic studies, On-site collections, Water pollution effects, *Diversity, *Species diversity, *Species diversity indices, Endangered species.

A baseline study of fishes was conducted in streams draining various test ranges currently used for testing and evaluation of conventional munitions. The purpose of the effort was to determine a species diversity index for each of the streams to be used for comparison data in future studies and for use in environmental documentation. Twenty-three species of fishes and one lamprey species were collected or observed. All specimens were preserved and catalogued for placement in the Air Force Armament Laboratory's fish reference collection. Many streams sampled serve as the habitat for an endangered species, the Okaloosa darter. One hundred and fifteen specimens of the Okaloosa darter were observed and released unharmed. (EIS-Deal)
W79-00277

DYNAMIC PROGRAMMING AND THE PRINCIPLE OF OPTIMALITY: A SYSTEMATIC APPROACH,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-00396

8. ENGINEERING WORKS

8A. Structures

COMPUTING TWO-DIMENSIONAL DAM-BREAK FLOOD WAVES,
California Univ., Davis. Dept. of Land, Air and Water Resources.
N. Katopodes, and T. Strelkoff.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, p 1269-1288, September 1978. 8 fig, 14 ref, 2 append.

Descriptors: *Dam failure, *Flood waves, *Mathematical models, *Unsteady flow, *Algorithms, Reservoirs, Hydraulics, Dams, Computers, Model studies, *Method of characteristics, Wave propagation, Inundation, Wave fronts.

A mathematical model of two-dimensional unsteady flow through a breached dam was developed. The numerical method of characteristics in three independent variables was used to construct an algorithm correct to second order with respect to time. The solution progresses at specified time intervals. At any time, the flow conditions are obtained by extending characteristic conoids back to a previously computed time plane and allowing information to propagate along the curvilinear rays of these conoids. Both the negative wave propagating into the reservoir and the jet emerging from the breach and eventually inundating the valley downstream of the dam were modeled in detail. Arbitrary dam geometry and channel topography can be taken into account. Propagation of the wave fronts was simulated by a computational grid moving with time. The exact computed resuls of the model were presented graphically as axonometric projects for the depth and as plan-view, two-dimensional vector fields for the flow velocities. (Singh-ISWS)
W79-00313

A MATHEMATICAL MODEL FOR SIMULATING WATER DEMAND-SUPPLY AND ENERGY USES FOR THE STATE OF PENNSYLVANIA,
Pennsylvania State Univ., University Park.
H. H. Martinez.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 154, Price codes: A07 in paper copy, A01 in microfiche. Master of Science thesis, March, 1978. 122 p, 10 fig, 32 tab, 22 ref, append. OWRT A-048-PA(2), 14-34-0001-7080.

Descriptors: *Energy, *Water resources, *Water policy, Pennsylvania, Planning, *Linear flow model, *Energy policy, *Energy crisis, *Water/energy demand, *Water/energy system, *Water/energy policy, Socio-economic development, Supply-demand, Energy production model.

The high level of socio-economic development of society has been accompanied by high increments in water/energy demand. Since the recent energy crisis and the realization that there are severe limitations on raw energy and water resources, there has been a change in the thrust of water/energy policy toward the development of new domestic energy sources and better use controls for water resources. A linear Flow Model, as a mathematical tool, can be used to simulate different situations of water/energy supply-demand response to energy demand changes in order to make easier the planning and control of energy production in some optimal mode. Preliminary models of water supply-demand in Pennsylvania were established using Linear Flow Model methodology and use of these models to depict the operation of the Pennsylvania water/energy system was illustrated. The models will also be used to explore water/energy policy alternatives through impact studies. (Sink-Penna)
W79-00442

8B. Hydraulics

MECHANICAL CHARACTERISTICS OF DEBRIS FLOW,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 2J.
W79-00117

SCOUR OF BED MATERIAL IN VERY ROUGH CHANNELS,
Technical Univ. of Istanbul (Turkey). Dept. of Hydralic and Water Power.
For primary bibliographic entry see Field 2J.
W79-00122

MEASUREMENTS OF BED LOAD IN OSCILLATORY FLOW,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W79-00141

WATER WELL DEVELOPMENT DECISIONS,
Texas A and I Univ., Kingsville. Dept. of Civil and Mechanical Engineering.
M. M. Truitt.
Public Works, Vol. 109, No. 8, p 83, August, 1978. 1 fig, 3 ref.

Descriptors: *Well development, *Gravel packs, *Well screens, *Well design, Specifications, Water wells, Design criteria.

Three important decisions in water well design and construction are: (1) Is a gravel pack needed; (2) If so, what size gradation should be specified; and (3) what size well screen is proper. A gravel pack is needed if the effective size or tenth percent of the water bearing sand is less than 0.01 inch. The gravel pack must have voids small enough to keep sand from passing through the well screen into the well yet have sufficiently permeability. The mea grain size of the gravel pack should be 4 or 5 tim the mean grain size of the formation (water sand and the uniformity coefficient or the ratio of th sixtieth percantile to the tenth percantile should b between 2.0 and 2.5. The slot size of the scre should retain between 85 and 100 percent of th filter material. (Purdin-NWWA)
W79-00167

DIGGING FOR NEW SOURCES OF ENERGY.
Drilling-DCW, Vol. 39, No. 12, p 134, Septembe 1978.

Descriptors: *Geothermal studies, *Therm water, Gulf coastal plain, Methane, Drilling.

General Curde Oil Co. and the U.S. Department Energy will spend up to $8 million on the fir geopressured-geothermal test well. At a targ depth of 16,500 ft., researchers hope to find lar bodies of overpressured hot water trapped in sed mentary layers which can be used for electr power generation. In addition, the hot water m contain as much as 82 trillion cu. ft. Gulf Coast one of several projects around the country. Oth geothermal experimental drilling can be found the U. S. East Coast and in Idaho. (Purdi NWWA)
W79-00175

REGIONAL GEOLOGY SERIES: PART VI THE COLORADO PLATEAU,
National Water Well Association, Worthingto OH.
H. W. Heiss.
Water Well Journal, Vol. 32, No. 10, p 53-64. 1 fi

Descriptors: *Groundwater, *Regional analys *Water wells, *Drilling, *Colorado Platea Geology, Climates, Aquifers, Water yield, Wat quality, Southwest U.S.

The Colorado Plateaus region is comprised of i dividual plateaus of faulted, deeply-eroded sed mentary rocks. Climate is arid to semiarid sin precipitation varies with topography. Altitud with sufficient precipitation are too cold for ra ing crops, and irrigation is necessary in warm areas. Ground water reservoirs are mostly san stone and limestone but a few wells top alluv sand deposits and basalt. Many wells must drilled through several hundred feet of unsat rated rock due to drainage of ground water in canyons and low permeability of sandstone. Gallup, New Mexico, domestic and municip wells 200-1000 ft. deep are drilled with cable-to rigs into sandstone at rates averaging 120-350 deep into sandstone which yield 25 to 40 gpm water containing moderate iron. In Camp Verd Arizona, domestic wells are drilled 60 to 300 fe through alluvium and cavernous limestor Boulder fields and caving sands are two problem encountered in this area. Acid ground water c curs in nearby Corville, Arizona. In Flagsta Arizona, large industrial wells 400 to 500 ft de yield at least 1000 gpm, and some yield 3500 gp of good quality water. (Purdin-NWWA)
W79-00177

NEW APPROACH GETS RESULTS IN UTA WELL,
Indian Health Service, Phoenix, AZ. Office of E vironmental Health.
R. E. Hatten.
Johnson Drillers Journal, Vol. 50, No. 4, p 5 July-August, 1978. 2 fig.

Descriptors: *Groundwater, *Water supp development, *Water wells, Infiltration galleri Caissons, Well screens, Well filters, Utah.

In an area near the borders of Arizona, New Me ico, and Utah most domestic water requirements obtained from ground water. A chronic problem

area is loss of production due to clogging of screens by sand and silt. To overcome this lem, the U. S. Public Health Service and the ajo Engineering and Construction Authority gned a radically different well. An 8-foot wide 6-foot long caisson was constructed and two ction galleries were dug from the caisson to a by river. A non-woven fabric, designed for an e-ground septic tank leach field, was used as ter medium for the collection galleries. En- ce velocity was reduced from one-tenth to less one-hundredth of a foot per second. A 6-inch well screen was selected and a 10-20 gravel used. The well produced 1000 gpm for 72 s, at which time drawdown had stabilized. indicated that the well would satisfy the com- ity's needs for at least the next 20 years. din-NWWA)
-00181

CTIONS AND PROPERTIES OF DRILLING
).
primary bibliographic entry see Field 8G.
-00186

VERTICAL PLANAR MOTION CHANISM; A DYNAMIC TEST APPARATUS EVALUATING CURRENT METERS AND IER MARINE INSTRUMENTATION,
onal Ocean Survey, Rockville, MD.
primary bibliographic entry see Field 7B.
-00224

EE-DIMENSIONAL OPEN CHANNEL W,
burg Univ., PA. Dept. of Civil Engineering.
. Chiu, D. E. Hsiung, and H. C. Lin.
nal of the Hydraulics Division, American ety of Civil Engineers, Vol. 104, No. HY8, p -1136, August 1978. 11 fig, 1 tab, 4 ref, 2 ap-
.

riptors: *Alluvial channels, *Hydraulics, en channels, *Open channel flow, Unsteady , Fluid mechanics, Mathematical studies, ations, Three-dimensional flow, Secondary , Hydrodynamic equations.

pen channel flow is usually three-dimen- l, consisting of the primary and secondary s. The primary flow was defined herein as the component in the longitudinal direction of the nel, while the secondary flow includes the ining flow components in the vertical and verse directions of the channel. In an alluvial nel, the channel cross sections and, thus, the -dimensional flow structure vary irregularly ndomly along the flow. A technique was loped and presented herein that can be used mpute secondary currents and, thus, the ir- ar three-dimensional structure of open chan- flow. The technique uses analytical, odynamic equations along with measured data annel geometry and primary flow velocity bution. Illustrative examples were presented results of practical applications of the nique, describing the variability of the tion and magnitude of secondary currents time, space, and discharge rate. (Lee-ISWS)
-00312

ERICAL STUDY OF CONTINUOUS SAL- ION,
South Wales Univ., Kensington (Australia).
ol of Mechanical and Industrial Engineering.
Reizes.
al of the Hydraulics Division, American ty of Civil Engineers, Vol. 104, No. HY9, edings Paper 14030, p 1305-1321, September 12 fig, 15 ref.

riptors: *Bed load, *Saltation, *Numerical sis, Hydraulics, Hydrodynamics, Particle , Particle size, Sedimentation, Flow, Reynolds number, Mathematical studies, *Particle trajectories, Solids flow.

Continuous saltation is understood to occur when a particle in a horizontally flowing fluid rebounds repeatedly from the bed of a flume without being deposited. The motion of an isolated spherical particle near a bed of similar particles in an orderly horizontal array was simulated numerically. A three-dimensional model based on coefficients of restitution and friction was developed for the bed interaction with the moving particle. It was shown that the upward component of the drag force on a downward moving particle can be greater than the net gravitational force on that particle. For different values of the relative particle density, the results for average height of bounce, average particle horizontal velocity, and rate of solids transport cannot be reduced to a single well-ordered family of curves when the Shields entrainment function and the particle Reynolds number are used as independent parameters. The results can be correlated if these parameters are each multiplied by a factor containing the relative particle density. (Lee-ISWS)
W79-00314

AIR ENTRAINMENT IN RADIAL FLOW TOWARDS INTAKES,
Government Coll. of Engineering and Technology, Raipur (India). Dept. of Civil Engineering.
A. K. Jain, K. G. R. Raju, and R. J. Garde.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 14038, p 1323-1329, September 1978. 3 fig, 3 ref.

Descriptors: *Air entrainment, *Intakes, *Flow, Intake structures, Froude number, Hydraulics, Hydraulic structures, Reservoirs, Viscosity, Water circulation, *Radial flows, Vertical pipe intakes.

The aim of this paper was to understand clearly the role of the different parameters on vortex formation. A study was made where the vanes for circulation are radial and thus the approach flow is free from circulation. Air entrainment in radial flow at intakes occurs when the submergence is greatly reduced, and the flow is of the gulping type with the liquid surface above the intake pulsating. It was shown by experimentation that the critical submergence is practically independent of the viscosity, as well as the surface tension of the liquid. In radial approach flow towards vertical pipe intakes, the safe submergence to prevent air entrainment always must be greater than the value predicted by the proposed equation for ranges of the Froude number between 1.1 and 20. (Lee-ISWS)
W79-00315

PRESSURE FLUCTUATIONS BENEATH SUBMERGED JUMP,
University of Manchester Inst. of Science and Technology (England). Dept of Civil and Structural Engineering.
R. Narayanan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 14039, p 1331-1342, September 1978. 9 fig, 1 tab, 12 ref, 2 append.

Descriptors: *Hydraulic jump, *Submergence, *Flumes, *Pressure, *Fluctuations, Hydralics, Jets, Laboratory tests, Froude number, Non-uniform flow, Viscosity, Velocity, Stability, *Submerged jump, *Pressure fluctuations, Efflux depth, Unstable disturbances.

Wall pressure fluctuations were measured beneath a hydraulic jump that was completely submerged. Two effiux velocities, 3.3 m per s and 2.6 m per s, were used; the corresponding Froude numbers were 9.8 and 7.7, respectively. For a distance of 42 times the efflux depth, the intensity of the fluctuations si 4 to 7 times that beneath a turbulent boundary layer. It declines only slowly with downstream distance. Inertial scaling brings together the spectra for the velocities at higher frequencies. Evidence was presented for the contribution of the fluctuations due to the unsteadiness of the mass of water in which the jet spreads. The inviscid instability of the submerged hydraulic jump was investigated. There was agreement between the dominant frequency of pressure fluctuations beneath the submerged hydraulic jump and the frequency of the most unstable disturbances predicted by the theory. (Singh-ISWS)
W79-00316

SEVEN PROBLEMS IN BUBBLE AND JET DROP RESEARCHERS,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
D. C. Blanchard, and L. D. Syzdek.
Limnology and Oceanography, Vol. 23, No. 3, p 389-400, May 1978. 2 fig, 1 tab, 30 ref.

Descriptors: *Air-water interfaces, *Bubbles, *Drops(Fluids), Laboratory tests, Analytical techniques, Bacteria, Jets, Equipment, Methodology, Physics, Water properties, Physical properties, Limnology, Oceanography, Laboratory techniques, Bubbles bursting, Jet drops.

Four of the problems deal with the mechanics of bubble production and bursting, and the collection and sizing of jet drops:; three concern the transfer of the bacterium Serratia marcescens from bursting bubbles to jet drops. The problem of producing bubbles of a specified size from glass capillary tips is overcome by paying careful attention to tip geometry. Problems associated with bubble bursting have not been solved, but it is believed that they are caused by small differences in the position of the bubble relative to the interface at the time of bursting. The collection and sizing of jet drops can cause problems, but suggestions were given to overcome them. Of the three problems involving bacteria, only the last appears to have a satisfactory solution. Experiments showed that the concentration of bacteria is always highest in the top jet drop of the jet and decreases progressively in the lower drops, being lowest in the bottom drop. This is in qualitative agreement with the hypothesis of jet drop formation advanced by MacIntyre. (Sims-ISWS)
W79-00319

EDDY PRODUCTION INSIDE WALL LAYERS,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera.
E. Levi.
Journal of Hydraulic Research, Vol. 16, No. 2, p 107-122, 1978. 10 fig, 41 ref.

Descriptors: *Boundary layers, *Eddies, *Vortices, *Viscous flow, *Shear drag, Fluid mechanics, Flow, Reynolds, Turbulence, Water circulation, Wals, *Wake trails, Wall layers, Drag-reducing flows, Streamwise eddies.

Turbulent eddies created inside wall region are assumed to be wake trails shed by low-speed fluid tongues ejected out of viscous sublayer. The assumption is corroborated by experimental evidences. As a result, it was shown that there are 3 kinds of those eddies: streamwise eddies, undulated eddies, and annular eddies. Their properties were described. An application of those concepts to a comparison between the behavior of Newtonian and drag-reducing flows shows the usefulness of the proposed model for a deterministic approach to the forecasting of the structure of turbulent flows. (Singh-ISWS)
W79-00333

MOMENTUM TRANSFER IN A COMPOUND CHANNEL,
Ulster Coll. Northern Ireland Polytechnic, Jordanstown.
W. R. C. Myers.
Journal of Hydraulic Research, Vol. 16, No. 2, p 139-150, 1978. 10 fig, 2 tab, 9 ref.

Descriptors: *Momentum, *Flood plains, *Natural streams, *Boundary processes, Flumes, Model studies, Hydraulics, Shear stress, Vortices, Channels, *Compound channel, Flood wall, Interacting condition.

A Preston tube was used to measure shear stress distributions around the periphery of a complex channel, consisting of a deep section and one flood plain. Measurements were made with full cross section flow and with flow confined to the deep, or channel, section. The results were used to quantify the momentum transfer due to interaction between the channel flow and that over its flood plain, demonstrating the danger of neglecting this phenomenon in complex channel analysis. Lateral momentum transfer throughout the channel and flood plain was compared under isolated and interacting conditions. (Singh-ISWS)
W79-00334

HYDRAULIC MODEL INVESTIGATION OF A TWO-WAY DROP INLET FOR FLOODWATER RETARDING STRUCTURE NO. 3, BANKLICK CREEK WATERSHED, BOONE AND KENTON COUNTIES, KENTUCKY,
Department of Agriculture, Minneapolis, MN. Science and Education Administration.
C. L. Anderson.
Report No. ARS-NC-63, August 1978. 24 p, 17 fig, 6 tab, 2 ref.

Descriptors: *Hydraulic models, *Laboratory tests, *Spillways, *Hydraulic structures, *Kentucky, Reservoirs, Flow control, Model studies, Discharge(Water), Pressure conduits, Measurement, Hydraulics, Data collections, Pressure, Performance, Spillway crests, Methodology, Weirs, Testing, Flow, Flow characteristics, *Banklick Creek(Ky), Drop inlet spillways.

This report described hydraulic model studies of a two-way drop inlet closed conduit spillway for a floodwater retarding structure. The proposed structure was unique. Although the crest of the drop inlet was 4 pipe diameters (4D) long, and the drop inlet was 2D long, requiring a contraction section between the crest section and the drop inlet shaft. The purposes of the model study were (1) to observe the performance, and (2) to determine the flow and pressure coefficients of the drop inlet. This report described the proposed prototype structure, and it presented the results of tests on the original design and several modifications of the spillway. The flow into the drop inlet was disturbed by the contraction between the 4D-long weir crests and the 2D-long drop inlet. The jets from the sloping endwalls in the contraction intersected the nappes falling from the crest. However, these disturbances did not noticeably affect the performance of the structure. The longitudinal splitter wall prevented lateral sloshing of the boil supported on the nappes as the weirs became submerged. When the longitudinal wall was removed, sloshing of the nappes occurred. (Humphreys-ISWS)
W79-00341

STOCHASTIC PROCESSES IN WATER RESOURCES ENGINEERING.
Lund Inst. of Tech. (Sweden). Dept. of Water Resources Engineering.
Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Sweden, August 1976. Water Resources Publications, Fort Collins, Colorado, 1977. 552 p, 184 fig, 59 tab, 328 ref. Gottschalk, L., Lindh, G., and de Mare, L., Eds.

Descriptors: *Stochastic processes, Water resources, *Engineering, *Simulation analysis, *Hydraulics, *Risk analysis, *Analytical techniques, Hydrology, Rivers, Reservoirs, Design, Mathematical models, Equations, Systems analysis.

Stochastic methods have long been applied to problems in certain fields of hydraulics, i.e., turbulence, sediment transport, and wave analysis. The First International Symposium on Stochastic Hydraulics was held in Pittsburg in 1971, showing a trend towards more sophisticated stochastic methods and their application to new areas of hydraulics. This trend becomes even more pronounced at the Second International Symposium held in Lund in 1976. Papers here show a wide spectrum of hydraulic problems approached by stochastic methods and the introduction of new statistical concepts such as Kalman-filtering and entropy. This Proceedings has been published in two separate books: (1) Stochastic Processes in Water Resources Engineering, and (2) Hydraulic Problems Solved by Stochastic Methods. The former is divided into 3 sections: analysis and simulation of stochastic hydraulic processes; risk analysis and water resources systems. Dealt with are such subjects as sediment storage modeling for reservoirs, the interpretation of surge wave attenuation by the Passage Theory; discounted flood risks in least-cost design of storm sewer networks; uncertainties on roughness for pipe design; stochastic models applied to reservoirs near the Alps; and a stochastic optimization model of the Lech River system. This book contains 25 of the 53 papers presented, representing authors from 17 countries. Detailed analytical techniques are applied throughout to solve a wide variety of problems in stochastic water resources engineering, including estimation theory, simulation analysis, dynamic programming, and trade-off analysis. (Bell-Cornell)
W79-00380

STORMWATER MODELING,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00381

HYDRAULICS OF GREAT LAKES INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
W. N. Seelig, and R. M. Sorensen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 074, Price codes: A04 in paper copy, A01 in microfiche. Technical Paper No. 77-8, July 1977. 69 p, 32 fig, 8 tab, 15 ref.

Descriptors: *Inlets(Waterways), *Seiches, *Bays, *Great Lakes, *Hydraulics, Lakes, Velocity, Hydrographs, Continuity equation, Numerical analysis, *Inlet-harbor resonance, Inlet hydraulics, Reversing velocities.

A simple numerical model was developed to predict inlet velocities, discharge, and bay levels for Great Lakes inlets. The model was applied to several inlets. Examples were given using the model for typical design computations. Numerical modeling of selected inlets showed that head, temporal acceleration of inertia, convective acceleration, and friction may all be important in controlling the hydraulics of these inlets. Temporal acceleration may be specially important as it causes bay fluctuations to be amplified and out of phase with the forcing wave. Even a small-amplitude seiche may generate significant reversing inlet velocities if the wave period is near the inlet-bay Helmholtz period. Reversing velocities at most inlets are generally small. However, the velocities may be high if the inlet is located where the lake seiche amplitudes are relatively large and have a period approximately equal to the inlet-bay system Helmholtz period. (Singh-ISWS)
W79-00469

VORTEX FORMATION AT VERTICAL PIPE INTAKES,
Government Coll. of Engineering and Technology, Raipur (India). Dept. of Civil Engineering.
A. K. Jain, K. G. Ranga Raju, and R. J. Garde.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Proceedings Paper 14104, p 1429-1445, October 1978. 11 fig, 14 ref, 2 append.

Descriptors: *Entrainment, *Intakes, *Model studies, Dimensional analysis, Hydraulic models, Pipe flow, Vortices, Submergence, Pipes, Air entrainment, Froude number, Similarities, Circular vortex tanks, Guide vanes.

With the object of determining the similarity criterion, experimental studies on vortex formation at pipe intakes were carried out using two geometrically similar circular vortex tanks; circulation in approach flow was generated by means of adjustable guide vanes. Transparent pipe intakes of different sizes and liquids of different viscositites and surface tensions were used in a recirculating system. Based on the analysis of data, a method was proposed, according to which a geometrically similar model is operated at the same Froude number as in the prototype; and the observed critical submergence is corrected for distortion due to change in the model Reynolds number. A criterion to determine the type of vortex for known geometric and kinematic conditions also was proposed. (Lee-ISWS)
W79-00485

INTERNAL FRONTS IN TWO-LAYER FLO,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering; and Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics.
C. Kranenburg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Technical Note, p 1449-1453, October 1978. 5 fig, 8 ref, 1 append.

Descriptors: *Density currents, *Internal waves, *Theoretical analysis, *Flow, Analytical techniques, Mathematical studies, Fluid mechanics, Waves(Water), Equations, Underflow, Hydrodynamics, Shape, Profiles, Two-layer flow.

The intrusion of a fluid layer into a heavier or lighter fluid has received considerable attention in literature. Two extreme cases regarding the ratio between the depths of the intruding layer and the continuous layer have been examined, i.e., the flow of a relatively thin layer in deep water and exchange flow. Exchange flow arises when a vertical barrier separating two fluid layers of approximately equal depths and slightly different densities is removed. A notable progress in the theoretical description of fronts of intruding layers (or density currents) is due to Benjamin who showed that hydrodynamical energy will be conserved only if the depth of the advancing layer equals half the total depth H. If h is less than (1/2)H a loss of energy must occur in the continuous layer. Depths of the advancing layer greater than half the total depth would require a gain of energy, which is physically unrealistic. On the basis of energy considerations, it can be concluded that for real fronts h is equal to or less than (1/2)H. The technical note showed that a more restrictive condition for the existence of fronts than that given by this equation results from an analysis of the stability of a front in relation to internal wave disturbances. (Humphreys-ISWS)
W79-00486

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2E.
W79-00492

SIZES FROM MODIFIED MOODY DIA-
1,
gan Univ., Ann Arbor. Dept. of Applied
anics and Engineering Science.
imary bibliographic entry see Field 3F.
0499

Hydraulic Machinery

ER/ENERGY MANAGEMENT AND
UATION MODEL FOR PENNSYLVANIA,
ylvania State Univ., University Park. Dept.
ustrial and Management Systems Engineer-

imary bibliographic entry see Field 6D.
0007

GY CONVERSION SYSTEM,
imary bibliographic entry see Field 4B.
0037

ESS AND SYSTEM FOR RECOVERY OF
GY FROM GEOTHERMAL BRINES AND
R WATER CONTAINING SOURCES BY
CT CONTACT WITH A WORKING FLUID
W THE CRITICAL PRESSURE,
ental Petroleum Corp., Los Angeles, CA.
nee).
imary bibliographic entry see Field 4B.
0049

CT COOLING WITH GROUND WATER,
lay.
Well Journal, Vol. 13, No. 9, p 57, Sep-
r, 1978.

ptors: *Groundwater, *Cooling,
nditioning, Cooling water, Water wells.

e water is usually too warm for cooling but
l water from domestic water wells is an ideal
. Warm air is cooled by the ground water,
e cooled air is returned to the house. The
e water temperature needed for cooling and
idification is determined by the coil size,
flow, air flow, and the amount of cooling
d. Economics and space considerations
e a temperature of at least 57F. Higher tem-
re ground water or oversized air condi-
will cool but not dehumidify the air. Corro-
f heat extractor coils results if the coils are
um rather than copper, the ground water is
idic for copper tubing, or the plumbing is
is a ground for electric appliances. Since
is no compressor the operating costs of
l water cooling is much less than standard
compression air conditioning. However, its
ncy depends upon water temperature, well
and air volume. Ground water air condition-
its can be used in conjunction with a stan-
orced air furnace, heat pump, or solar ener-
ems. (Purdin-NWWA)
0173

PUMP ACCESSORIES CAN SAVE YOU
Y,
al Water Well Association, Worthington,

ersons.
Well Journal, Vol. 13, No. 9, p 47, Sep-
, 1978.

ptors: *Heating, *Heat pumps,
omics, Groundwater, Accessories, Energy
ncy, Costs.

erage residential ground water heat pump
etween $1500 and $3000. This initial invest-
s repayed through energy savings. Several
ories are described which can increase the
and cost efficiency of the heat pump.
accessories include: (1) an intermediate storage tank; (2) solar collectors; air conditioners; and water heaters. When a single cycle ground water heat pump is used, both refrigerant and vapor compression cycle tubing can be designed for optimum performance in either a heating or cooling cycle. (Purdin-NWWA)
W79-00174

HOUSING PROJECT TO UTILIZE GROUND WATER.
Water Well Journal, Vol. 32, No. 10, p 58-59. 1 fig.

Descriptors: *Heat pumps, *Solar energy, *Heating, *Cooling, Water utilization, Energy conservation, Groundwater.

A residential development near Dayton, Ohio will be heated and cooled by a solar energy/water source heat pump system. During the heating cycle radiant energy from the sun is transferred to water stored in an underground tank. During the summer, heat is extracted from interior spaces and dissipated to the ground water by using an underground closed loop as a heat exchanger. Initial cost for the system include: a solar water heater; a special grate to absorb fireplace heat; a microprocessor which automatically selects the most economical form of heating and cooling; a clothes dryer; and a kitchen range. Electric power for the units will be supplied by a bioconversion plant, where methane gas from human waste will be used to run a turbine generator. This system is predicted to work in 90 percent of the United States. (Purdin-NWWA)
W79-00178

WELL POINT SYSTEMS.
Drilling News, Vol. 3, No. 2, p 12, Winter, 1978. 1 fig.

Descriptors: *Well points, *Pumps, Aquifers, Drawdown, Shallow wells, Water wells.

A well-point system is a series of shallow boreholes connected to a central pump to obtain large quantities of water economically. Three conditions are necessary for a well-point system: (1) the water table must be within a few meters of the land surface; (2) a good aquifer must be found at depths of 6-15 m; and (3) the wells themselves must be highly efficient. Locating the wells on the circumference of a circle gives the system greatest hydraulic efficiency. The maximum drawdown at which the wells can be operated is the difference between the suction head of the pump and the static water level. A pump that has good suction characteristics should be selected. All piping connections on the suction side of the pump must be absolutely air tight and the well screen must be set before the suction limit of the pump. Where this is not possible due to a thin aquifer, the pumping rate must be reduced. An alternative to this is the use of a drop tube inside the well screen which will permit the pumping level to drop below the top of the screen. (Purdin-NWWA)
W79-00182

EFFICIENCY OF SCREENLESS WELLS FOR IRRIGATION,
Ministry of Reclamation and Water Management, Moscow (USSR).
For primary bibliographic entry see Field 3F.
W79-00184

WATER AND LAND RESOURCE ACCOMPLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES.
Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch.
For primary bibliographic entry see Field 3F.
W79-00193

WET COOLING TOWER BACKFITTING ECONOMICS,
Iowa Univ., Iowa City. Div. of Energy Engineering; and Iowa Univ., Iowa City. Div. of Research Engineering.
For primary bibliographic entry see Field 5G.
W79-00233

8D. Soil Mechanics

STABILIZATION OF EARTH SUBSURFACE LAYERS,
Woodbine Corp., Fort Worth, TX. (Assignee).
G. Cain, J. D. Teague, and P. J. Wright.
U.S. Patent No. 4,084,381, 8 p, 2 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 969, No. 3, p 835, April 18, 1978.

Descriptors: *Patents, *Soil stability, *Subsurface flow, Soil water movement, Soil strength, Groundwater movement, Stabilization, Fly ash, Lime.

A method of treating subsurface layers of the earth is provided to perform one of controlling movement of subsurface water and building strength of the subsurface layers. It is characterized by injecting at predetermined depth and at predetermined, spaced-apart locations a lime-fly ash slurry consisting essentially of water, particulate hydrated lime, particulate fly ash and surfactant. In the preferred embodiment, the paritculate lime and fly ash are present as particulate solids in a proportion within a range of 25-60% by weight of the water. The particulate solids comprise lime in a proportion of 25-50% by weight and fly ash in a proportion of 75-50% by weight. The invention relates to improving the subgrade for buildings, road beds, or the like. (OEIS-Sinha)
W79-00035

DEFLECTION OF P.V.C. PIPE UNDER BURIAL CONDITIONS,
Ontario Ministry of the Environment, Toronto.
M. B. Fielding.
Report No. R. P. S2045, May 1978. 16 p, 10 tab, 6 ref.

Descriptors: *Soil physical properties, *Piping systems, *Polyvinyl chloride, *Soil mechanics, Soil modulus, Passive resistivity, Spangler formula.

In designing flexible piping systems used for underground, nonpressurized flow, the resistance of the pipe to deflection is a function of both the stiffness of the pipe material and the lateral support provided by the surrounding soil. One type of plastic used for such piping is made of polyvinyl chloride (PVC). The design formula for flexible pipelines, first stated in 1941 by Spangler, took this concept into account and has become an accepted method of flexible conduit design. However, difficulties in obtaining values for some parameters, such as soil modulus of passive resistivity, has led to attempts to develop alternatives to the Spangler formula. Nevertheless, the modified Spangler approach remains theoretically sound and, with appropriate modifications, can achieve excellent results. One additional refinement is described: to incorporate measurable values of pipe stiffness isn place of 'EI' in the formula delta x = D.K.Wc. cu r/EI + 0.016E' cu r. THe soil modulus is essentially an unmeasurable quantity and is usually determined experimentally by measuring pipe deflection under a known load and calculating the value of E' which would limit deflection to the measured value. In this paper, the values used for E' were collected from several reference sources and are tabulated for several representative soil types. Sample computations are included and the resuls for maximum long term deflection of nine types of PVC pipe are tabulated for class I and II gravel, sand, clay, and peat. (Majtenyi-IPA)
W79-00103

USING ICE AS WATER-IMPERMEABLE ELEMENT IN ROCKFILL DAMS,
N. A. Tsytovich, V. A. Vesilov, and N. V. Styrova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 539, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 661, November 1977. 8 p, 2 fig, 3 ref. Translated from Trudy Koordinatsionnykh Soveschanii Po Gidrotekhnike, Vol. 10, p 132-136, 1964.

Descriptors: *Rockfill dams, *Cold weather construction, *Model studies, Mathematical models, Ice, Freezing, Thawing, Permeability, Cold regions, Earth dams, Dams, Structures, Hydraulic structures, Temperature, Heat transfer, Ice cores.

At the present time, rockfill dams are used extensively in the Soviet Union and abroad. It is known that the antifiltration elements in them are cores or screens made of water-impermeable materials. After analyzing planning materials and experience in construction of structures under harsh climatic conditions, constructing rockfill dams with ice cores in areas where permafrost soil occurs was suggested in 1961. The natural conditions in the proposed construction regions are characterized by harsh and prolonged winters, with a considerable thickness of permafrost, which is a positive factor for construction and operation of these dams. The principal difficulty in building such a dam under conditions where permafrost soils occur involves the changes in the temperature regime of the body of the dam and its foundation over the course of time. A method was developed to calculate the nonstationary temperature field of a frozen rockfill dam and a foundation under any given boundary conditions, determined by the natural data of the region. As a result of the studies, it was found that the version of the rockfill dam with an ice core can have sufficient thermal and statistical stability. These studies are continuing, but the results already obtained indicate that such a dam is competitive with other structural varieties. (Sims-ISWS)
W79-00466

ALLOWING FOR THE WATER PERMEABILITY OF FROZEN GROUND SCREENS DURING THEIR FORMATION,
A. I. Pekhovich.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 899, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 591, February 1977. 8 p, 4 fig, 5 ref. Translated from Izvestiya Vsesoyuznogo Nancho-Issledovatel'skogo Instituta Gidrotekhniki imeni B.Ye. Vedeneyev, Vol. 54, p 208-213, 1955.

Descriptors: *Cofferdams, *Frozen ground, *Permeability, Cold regions, Cold weather construction, Dams, Freezing, Infiltration, Model studies, Mathematical models, Structures, Hydraulic structures, Soil water, Soil water movement, Soil science, Earth dams.

Creation of water-impermeable cofferdams is an important and sometimes extremely complex problem which builders, in particular those who construct hydraulic facilities, are frequently called upon to solve. One of the most widely used methods of constructing water-impermeable dams is the method of artificially freezing ground. Artificially freezing ground, consists of the following: Freezing columns are implanted in the dam with a certain distance between them. Brine is circulated in the columns and is cooled by a refrigeration device. Initially, individual frozen ground cylinders are formed around each column, and these cylinders then join into a single water-impermeable mass. It is obvious that between the beginning of freezing and the complete interconnection of the frozen ground cylinders, the rate of the filtration flow through the cofferdam changes. The question of how large the filtration flow is during this period is not only of theoretical but also of considerable practical interest--for instance in determining the value of the heat flow from the nonfrozen ground to the frozen ground cylinders (in calculating the freezing speed), in determining the possible value of the filtration flow rate through the cofferdam when the frozen ground cylinders do not join completely (the problems of drainage from the excavation), etc. Unfortunately, no appropriate calculation method has yet been devised. This article was designed to fill this gap. (Sims-ISWS)
W79-00467

FREE-SURFACE SEEPAGE PROBLEM,
California Univ., Santa Barbara. Dept. of Mathematics.
J. M. Sloss, and J. C. Bruch, Jr.
Journal of the Engineering Mechanics Division, American Socity of Civil Engineers, Vol. 104, No. EM5, Proceedings Paper 14058, p 1099-1111, October 1978. 3 fig, 3 tab, 17 ref, 2 append.

Descriptors: *Dams, *Seepage, *Model studies, *Mathematical models, Earth dams, Equations, Mathematics, Flow, Groundwater movement, Drainage, Computer models. Analytical techniques, Civil engineering, Variance analysis, Dam underseepage, Inequalities.

The flow problem of seepage through a homogeneous dam on an impervious foundation with a toe drain was solved numerically using the Baiocchi method. The numerical scheme reduces to an algorithm that is computationally efficient, accurate, and fast, and requires only a fraction of the preprocessing effort time that the other numerical algorithms do. The results compared well with other numerical and analytical results. The problem also was reduced to a variational inequality that was shown to have at most one solution from which it follows that the original problem has at most one solution. (Sims-ISWS)
W79-00496

8E. Rock Mechanics and Geology

SUMMARIES OF PHYSICAL RESEARCH IN THE GEOSCIENCES.
Department of Energy, Washington, DC. Div. of Basic Energy Sciences.
For primary bibliographic entry see Field 10F.
W79-00101

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES TUNNEL SYSTEM.
Booz-Allen Applied Research, Bethesda, MD.
For primary bibliographic entry see Field 5D.
W79-00465

8G. Materials

LOW MOLECULAR WEIGHT HYDROLYZED POLYACRYLAMIDE USED AS A SCALE INHIBITOR IN WATER SYSTEMS,
American Cyanamid Co., Stamford, CT. (Assignee).
For primary bibliographic entry see Field 5F.
W79-00027

TREATMENT OF WATER OR AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W79-00039

EMPLOYING METHYLENE PHOSPHONATES OF OXYALKYLATED POLYALKYLENE POLYAMINES IN CHELATION AND/OR SCALE INHIBITION,
Petrolite Corp., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5F.
W79-00052

LOW TOXIC CORROSION INHIBITORS FOR ALUMINUM IN FRESH WATER,
National Aeronautics and Space Administration Huntsville, AL. George C. Marshall Space Fligh Center.
T. S. Humphries.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as N7828226 Price codes: A02 in paper copy, A01 in microfiche Report No. NASA TP-1279, July 1978. 16 p, 3 tab.

Descriptors: *Corrosion control, *Aluminum *Chemical reaction, Sodium chromate, Borates Nitrates, Phosphates, Silicates, Sodium mercap tobenzothiazole, Hydrogen ion concentration Water injury, Inhibitors, Inorganic compounds Nitrites, Sodium compounds.

The effectiveness of using combinations of chemi cals to inhibit the corrosive action of water on alu minum was evaluated. Since use of chromate in hibitors was restricted, there is a need for new low toxicity inhibitors. Combinations of several in organic chemicals, such as borates, nitrates nitrites, phosphates, and silicates, as well as sodi um mercaptobenzothiazole were evaluated at vari ous concentrations and conditions, including tem perature and pH. Combinations were use because, individually, these compounds are onl partially effective as inhibitors of corrosion. Of 5 mixtures tested, 8 showed excellent corrosion in hibition on 2219-T87 aluminum compared to sodium chromate standard. (Majtenyi-IPA)
W79-00091

DEFLECTION OF P.V.C. PIPE UNDER BURIAL CONDITIONS,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 8D.
W79-00103

WATER ANALYTICAL DATA AS A TOOL IN DRILLING AND PRODUCTION ECONOMICS,
W. C. Martin.
Journal of Petroleum Technology, Vol. 30, No. 9 p 1342-1346, September, 1978. 4 tab.

Descriptors: *Water analysis, *Water chemistry *Oil reservoirs, *Drilling, *Water sources, Wate pollution, Injection, Compatibility, Corrosion Scaling, Water sampling.

A detailed summary is provided of the applicatio of water analytical data in drilling and producin oil and gas. Basic requirements for sampling an analysis of water are tabulated. It is important t examine each constituent and its relationship t other constituents in determining the origin of an water. Various sources of water are: casing leaks injection breakthrough; connate water; acid treat ment water; drilling brine; produced water; irriga tion water; sewage effluent; and other wast water. The compatibility of two or more water must be determined before they are combined Several common incompatible combinations ar listed. The potential corrosiveness of any wate must be evaluated. Hydrogen sulfide, carbon diox ide, oxygen, pH, temperature and undersaturatio are the principle parameters. The presence o aerobic bacteria and coloration of the water in dicates air contamination which may aggravat corrosion. It is possible to predict whether a wate will deposit scale. Four common scaling com ponents: calcium carbonate, calcium sulfate, bari um sulfate, and strontium sulfate are discussed Water analytical data such as filterable solids abrasives, suspended oil, and bacteria are useful i injection water studies. (Purdin-NWWA)

0168

CT COOLING WITH GROUND WATER,
imary bibliographic entry see Field 8C.
0173

PUMP ACCESSORIES CAN SAVE YOU
Y,
al Water Well Association, Worthington,

mary bibliographic entry see Field 8C.
0174

NDWATER PUMPING TECHNIQUES
XCAVATIONS AND OTHER WORKS,
Cashman.
g News, Vol. 3, No. 2, p 7-11, Winter, 1978.

ptors: *Dewatering, *Excavation,
ment(Structural), Well-points, Bored-filter
Freezing, Electro-osmosis, Aquifers,
, Soil mechanics, Artificial recharge.

d-water control during excavation can be
ed by pumping or forming an impermeable
. What technique should be used depends
type and strata of soil, foundation specifica-
nd groundwater encountered. The most
nly used methods of groundwater lowering
nventional sump pumping, well-pointing,
red filter wells. Lowering of the phreatic
increases the effective load on the soil and
use settlement, especially in a confined
. In some cases it may be necessary to em-
round water recharge to reduce potential
ent. Freezing and electro-osmosis form an
neable barrier under appropriate conditions.
ng can be used in all types of saturated soils
s. Liquid nitrogen provides a faster rate of
than brine. Electro-osmosis can be used in
very soft cohesive soils to reduce moisture
and increase shear strength. (Purdin-
A)
0185

IONS AND PROPERTIES OF DRILLING

News, Vol. 3, No. 3, p 6-12, Spring 1978.

tors: *Drilling fluids, *Colloids, *Wells,
, Rotary drilling, Technology(Wells), His-

story of the development of drilling mud
ogy is summarized. Various functions of
mud are discussed, such as: cooling the bit;
ng cuttings from the hole; preventing cav-
ntrolling of gas, oil, or water pressure in the
on penetrated; lubricating drill pipe, wall of
e, casing, slush pumps and bit bearings;
g corrosion; holding all solids in suspen-
the portion of the drilling mud in the hole,
arly during interruptions in drilling;
ing all sand and cuttings in the ditch or set-
; and facilitating the movement of drill pipe
ing. The ability of a drilling mud to fulfill all
ve functions, except those involving unit
is largely due to the concentration of col-
aterial in the mud. Other characteristics of
fluids that aid in performance of functions
edom from grit or abrasive particles; high
or unit weight; correct pH; and low con-
ons of salt and other electrolytes. A drilling
ust not deposit a thick filter cake on the
the hole nor allow a high volume of filtrate
e the formation. (Purdin-NWWA)
186

OPMENT OF LOW COST MEMBRANE
ING AGENTS,
W. R.) and Co., Columbia, MD.
nary bibliographic entry see Field 3A.
304

8I. Fisheries Engineering

STAMINA TUNNEL TESTS ON HATCHERY-REARED ATLANTIC SALMON,
Maine Cooperative Fishery Research Unit, Orono.
J. D. McNeish, and R. W. Hatch.
The Progressive Fish Culturist, 1978, Vol. 40(3), July 1978, p 116-117. 1 tab, 5 ref.

Descriptors: *Atlantic salmon, *Methodology, Laboratory tests, Laboratory equipment, *Fish physiology, *Fish diets, Aquaculture, Fish hatcheries, Maine, Juvenile fish, *Hatchery-reared Atlantic salmon, *Fish stamina, Stamina tunnel tests.

Authors describe a stamina tunnel for evaluating the stamina of hatchery-reared Atlantic salmon and to evaluate the effects on stamina of different diets and different fish establishments. They conclude that variables other than those to be tested were present and the apparatus could not be used. (EIS-Katz)
W79-00075

REARING OF CHINOOK SALMON IN TRIBUTARIES OF THE SOUTH FORK SALMON RIVER, IDAHO,
Intermountain Forest and Range Experiment Station, Ogden, UT.
W. S. Platts, and F. E. Partridge.
Department of Agriculture, Forest Service, Research Paper INT-205, 15 p, May, 1978. 3 fig, 12 ref, 4 tab.

Descriptors: *Chinook salmon, *Habitats, *Idaho, Fisheries, Stream fisheries, Fish management, Tributaries, Salmon, Aquatic habitats, Cutthroat trout, Aquatic animals, Aquatic life, Fish, Salmon River(Idaho), Trout.

Fish populations in 23 tributaries of the South Fork Salmon River (Idaho) were samples in 1971, 1972, and 1974. Juvenile chinook salmon were found in one secondary and 11 primary tributaries. The first 400 m reach of stream adjacent to the river was the most important area for rearing and supported 58% of the total tributary chinook salmon population. Only three tributaries had chinook salmon more than 1.6 km from the river. The tributary chinook salmon standing crop ranged from 0.01 to 0.38/sq m and averaged 0.06/sq m for all streams. Cutthroat trout and chinook salmon were not found together. Chinook salmon preferred the larger lower gradient, grassy-banked streams having deep pools. (Witt-IPC) al trophic balance. (Sinha-OEIS)
W79-00428

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, ANNOTATED BIBLIOGRAPHY.
Manuscript, Los Angeles, CA, August 1978, 46 p, Compiled by Michael Aron Weinberg.

Descriptors: *Bibliographies, *Rainfall, *Water vapor, *Atmosphere, *Plant physiology, Water balance, Water resources.

This bibliography contains 359 annotated entries, listed in chronological order, pertaining to atmospheric water vapor resources for rainfall and their relationship with water synthesis in plant life. Scientific and other periodicals, books, and plays are included, and each entry is coded as to subject, such as climate, chemistry, fiction, plants and plant physiology, and weather and meteorology. In addition, there is a list of authors by year giving keyword subjects, and an alphabetical list of authors. (Majtenyi-IPA)
W79-00106

FRAZIL ICE FORMATION: A REVIEW,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W79-00120

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX A,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-00188

ASBESTOS - A BIBLIOGRAPHY,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W79-00225

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-00272

PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS - OPTICAL BRIGHTENERS, METHYL CHLOROFORM, TRI-CHLOROETHYLENE, TETRACHLOROETHYLENE AND ION EXCHANGE RESINS,
Franklin Inst. Research Labs., Philadelphia, PA. Science Information Services Dept.
For primary bibliographic entry see Field 5A.
W79-00283

BIOLOGICAL EFFECTS AND ENVIRONMENTAL ASPECTS OF 1,3-BUTADIENE,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5C.
W79-00292

PCB IN WATER, A BIBLIOGRAPHY, VOLUME 3.
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5A.
W79-00305

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5D.
W79-00306

IRRIGATION EFFICIENCY, A BIBLIOGRAPHY, VOLUME 3.
Department of the Interior, Washington, D. C., Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.
W79-00307

AGRICULTURAL AND HYDROLOGICAL APPLICATIONS OF RADAR: FINAL REPORT,
Kansas Univ. Space Technology Center, Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W79-00464

10F. Preparation Of Reviews

SUMMARIES OF PHYSICAL RESEARCH IN THE GEOSCIENCES.
Department of Energy, Washington, DC. Div. of Basic Energy Sciences.
Report No. DOE/ER-0016, September 1978. 52 p.

Descriptors: *Geophysics, *Geothermal studies, *Remote sensing, Projects, *Department of Energy research, Aeronomy, Seismology, Geology, Hydrology, Geochemistry, Petrology, Energy, Meteorology, Sediments, Brines, Kinetics, Aqueous solutions.

Research supported by the Department of Energy is aimed at providing basic knowledge in the fields of earth, atmospheric, and solar/terrestrial sciences. This series of summaries prepared by the investigators describes work performed during 1977, the scope of work to be done in 1978, and some information on research planned for 1979. Included under the heading of on-site geosciences are programs on geoscience, remote sensing, aeronomy, geothermal energy, thermodynamics of silicates, seismology, magma energy research, and physical chemistry of geothermal solutions. Under the heading off-site geoscience, are such areas of research as seismology, meteorology, magnetic field annihilation process in the magnetosphere, isotopic studies of rare gases in terrestrial samples, and organic geochemistry of outer continental margin and deep ocean sediments. Among the programs related to water research are projects on geothermal energy, thermodynamics of high temperature brines, and kinetics and transport of aqueous solutions. (Majtenyi-IPA)
W79-00101

FRAZIL ICE FORMATION: A REVIEW,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W79-00120

SUBJECT INDEX

ABSORPTION
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications,
W79-00472 2G

ABSTRACTS
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

ACCESS
Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

ACCIDENTS
Safety Aspects of Toxic and Hazardous Spills,
W79-00345 5G

Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

ACCLIMATION
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera),
W79-00076 5G

ACETIC ACID
Solvent Extraction for Treatment of Wastewaters from Acetic-Acid Manufacture,
W79-00366 5D

ACID MINE WATER
Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

Continuous Electrochemical Synthesis Using a Packed Granular Electrode,
W79-00432 5D

Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water,
W79-00444 5A

Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

ACID STREAMS
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

ACIDIC SOILS
Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

ACIDIC WATER
Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,
W79-00321 5A

Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

ACTIVATED CARBON
Carbon Contact Column,
W79-00028 5D

What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies,
W79-00179 5F

On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle),
W79-00410 5D

ACTIVATED SLUDGE
Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

Water -- 1977.
W79-00342 5D

The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation,
W79-00350 5D

Effects of Dissolved Oxygen in the Oxygenation Activated Sludge Process,
W79-00351 5D

Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,
W79-00352 5D

Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

ADMINISTRATION
Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

ADSORPTION
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

Process for Purifying Aqueous Industrial Effluents.
W79-00399 5D

AERATION
Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

AERIAL PHOTOGRAPHY
Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

AEROBIC TREATMENT
Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5D

Aerobic Media Trickling Filter Applied to Nitrogen Control,
W79-00445 5D

A Study for Improving the Aerobic-Media Trickling Filter,
W79-00457 5D

AFRICA
A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

AGENCY-GOVERNMENT INTERFACE
A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

AGGREGATES
Seepage Control by Particle Size Selection,
W79-00484 4A

AGRICULTURAL ECONOMICS
Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

AIR ENTRAINMENT
Air Entrainment in Radial Flow Towards Intakes,
W79-00315 8B

AIR POLLUTION
Acid Precipitation in the Netherlands,
W79-00138 5A

Asbestos - A Bibliography,
W79-00225 5A

Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

AIR POLLUTION

Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

AIR POLLUTION EFFECTS
Asbestos - A Bibliography,
W79-00225 5A

AIR-WATER INTERFACES
Transfer of Gases at Natural Air-Water Interfaces,
W79-00127 2L

Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

AIRCONDITIONING
Direct Cooling with Ground Water,
W79-00173 8C

ALAR-85
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

ALBEDO
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

ALBERTA (CANADA)
Hydrogeology of the Grande Prairie Area, Alberta,
W79-00470 2F

ALDRIN
Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

ALGAE
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

ALGORITHMS
Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

ALIPHATIC COMPOUNDS
Environmental Effects of Schuylkill Oil Spill II, June 1972.
W79-00294 5C

ALKALIS (BASES)
Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

ALLUVIAL AQUIFERS
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

ALLUVIAL CHANNELS
Three-Dimensional Open Channel Flow,
W79-00312 8B

ALTERNATIVE PLANNING
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

Lake Level Control and Management--A Case Study,
W79-00390 4A

ALUM-MUD PRECIPITATION
Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation,
W79-00350 5D

ALUMINUM
Low Toxic Corrosion Inhibitors for Aluminum in Fresh Water,
W79-00091 8G

AMERICA FALLS RESERVOIR (IDA)
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

AMERICIUM
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

AMERICUM
Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

AMMONIA
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

AMMONIUM
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

AMMONIUM COMPOUNDS
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

AMPHIPODA
The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

ANALYTICAL TECHNIQUES
Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

Wet Cooling Tower Backfitting Economics,
W79-00233 5G

Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

Automated Determination of Selenium in Water,
W79-00261 5A

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Stochastic Processes in Water Resources Engineering.
W79-00380 8B

Stormwater Modeling,
W79-00381 5B

ANIMAL POPULATIONS
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,
W79-00068 5C

ANIONS
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

ANNUAL
An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

ANNUAL COSTS
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

ANTARCTICA
Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00340 2C

AQUACULTURE
Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
W79-00071 7B

AQUATIC LIFE
A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams,
W79-00407 5C

Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

AQUATIC WEED CONTROL
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
W79-00207 4A

AQUATIC WEEDS
Control of Aquatic Weed by Moth Larvae,
W79-00197 4A

Cattails (Typha Spp.)--Weed Problem or Potential Crop.,
W79-00198 2I

QUIFER CHARACTERISTICS
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

QUIFER SYSTEMS
Management Aspects of Cyclic Storage of Water in Aquifer Systems,
W79-00386 4B

QUIFERS
Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00111 2F

Kriging in the Hydrosciences,
W79-00134 2F

Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

RCADIA LAKE (OKLAHOMA)
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

RCTIC
Mixing in an Arctic Fjord,
W79-00487 2L

RIZONA
Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

RKANSAS
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

RKANSAS RIVER BASIN
Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

SBESTOS
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

Asbestos - A Bibliography,
W79-00225 5A

Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe,
W79-00435 5B

Investigation of Rainwater for the Presence of Asbestos,
W79-00437 5A

ASBESTOS CEMENT
Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe,
W79-00435 5B

ASBESTOS-CEMENT PIPE
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

ASPHALT
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

ASTERIONELLA FORMOSA
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

ATLANTIC SALMON
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

ATMOSPHERE
Atmospheric Water-Vapor Resources for Rainfall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.
W79-00106 10C

ATTITUDES
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

The Demand for Clean Water: The Case of the Charles River,
W79-00234 6B

AUSTRALIA
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

Field Investigation of Selective Withdrawal,
W79-00119 4A

The Isotope Hydrology of the Mereenie Sandstone Aquifer, Alice Springs, Northern Territory, Australia,
W79-00322 2F

Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

AUTOMATION
Simple Sampler Activation and Recording System,
W79-00480 7B

AVAILABLE WATER
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

BACTERIA
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Microbial Degradation of DDT,
W79-00278 5C

Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: I. Statistical Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting, (In Spanish),
W79-00385 5A

Denitrifying Bacteria Can be Enumerated in Nitrite Broth,
W79-00498 2G

BANKLICK CREEK (KY)
Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

BARIUM
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

BARK
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

BARROW STRAIT
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

BASE FLOW
Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

BASEFLOW
Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

BASINS
Simulation of Flows in Ungaged Basins,
W79-00331 2E

BATHYMETRY
Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,
W79-00488 2L

BAY OF BOURGNEUF (FR)
First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

BAY OF FUNDY (CANADA)
Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

BAYS
Hydraulics of Great Lakes Inlets,
W79-00469 8B

BED LOAD
Mechanical Characteristics of Debris Flow,
W79-00117 2J

Scour of Bed Material in Very Rough Channels,
W79-00122 2J

Measurements of Bed Load in Oscillatory Flow,
W79-00141 2J

BED LOAD

Numerical Study of Continuous Saltation,
W79-00314 8B

BEDS

Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

BEDS UNDER WATER

Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

BEHAVIOR

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

BELLMAN'S PRINCIPLE

Dynamic Programming and the Principle of Optimality: A Systematic Approach,
W79-00396 6A

BENTHIC FAUNA

Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

BENTHIC FLORA

Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

BENTHOS

Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs,
W79-00074 7B

BIBLIOGRAPHIES

Atmospheric Water-Vapor Resources for Rainfall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.
W79-00106 10C

Asbestos - A Bibliography,
W79-00225 5A

Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

PCB in Water, A Bibliography, Volume 3.
W79-00305 5A

Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.
W79-00306 5D

Irrigation Efficiency, A Bibliography, Volume 3.
W79-00307 3F

Agricultural and Hydrological Applications of Radar: Final Report,
W79-00464 7B

BIGHEAD

Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

BIOACCUMULATION

Criteria Document for DDT.
W79-00276 5A

Criteria Document for Toxaphene.
W79-00281 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

Multimedia Levels--Mercury,
W79-00291 5B

BIOASSAY

Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

BIOASSAY TECHNIQUES

Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

A Comparative In Vitro Study of the Effects of Various Balanced Saline Solutions on Respiration Rates of Liver Tissues of Three Fish Species,
W79-00454 5C

BIOASSAYS

Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
W79-00071 7B

BIOCHEMICAL OXYGEN DEMAND

Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD Test,
W79-00405 5A

BIOCIDES

Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

BIOCONTROL

Control of Aquatic Weed by Moth Larvae,
W79-00197 4A

BIODEGRADATION

Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

BIOINDICATORS

Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,
W79-00149 2I

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

BIOLOGICAL COMMUNITIES

Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures,
W79-00066 5B

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

BIOLOGICAL TREATMENT

Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities,
W79-00412 5D

BIOMAGNIFICATION

Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

BIOMASS

Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

BIOTA

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

BLACKFOOT RIVER (IDAHO)

Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho,
W79-00427 5C

BLEACHING WASTES

Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

Process for Purifying Aqueous Industrial Effluents.
W79-00399 5D

Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
W79-00404 5D

On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von

Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle),
W79-00410 5D

Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences,
W79-00419 5D

BOG
The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines,
W79-00202 2I

BOILERS
Water Treatment: Iron, Boiler Water and Water Analysis.
W79-00176 5F

BORES
Mechanical Characteristics of Debris Flow,
W79-00117 2J

BOSTON (MA)
The Demand for Clean Water: The Case of the Charles River,
W79-00234 6B

BOTTOM SEDIMENTS
Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations,
W79-00286 5A

BOULDERS
Origin and Transport of Large Boulders in Mountain Streams,
W79-00490 2J

BOUNDARY LAYERS
Eddy Production Inside Wall Layers,
W79-00333 8B

BOUNDARY PROCESSES
Momentum Transfer in a Compound Channel,
W79-00334 8B

BRACKISH WATE
Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

BRACKISH WATER
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

BRINE SHIRMP
A Procaryotic Intracellular Symbiont of the Great Salt Lake Brine Shrimp Artemia Salina (L.),
W79-00298 2H

BRITISH COLUMBIA
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

BROOK TROUT
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

BROWN TROUT
Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park,
W79-00082 5C

BRUSHLANDS
Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

BUBBLES
Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

BUTADIENE
Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

CADDIS-FLY
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

CADMIUM
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures,
W79-00066 5B

Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

CALCAREOUS SOILS
Water and Physical Properties of the Sod-Calcareous Soils of the Crimean Foothills (In Russian),
W79-00269 2G

CALCRETE
Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

CALIFORNIA (SOUTHERN)
Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

CAMBODIA
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

CAMBRIDGE BAY (N W T)
Mixing in an Arctic Fjord,
W79-00487 2L

CANADA
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery,
W79-00394 6E

Hydrogeology of the Grande Prairie Area, Alberta,
W79-00470 2F

Mixing in an Arctic Fjord,
W79-00487 2L

CAPILLARY WATER CAPACITY
Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

CAPTAN
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

CARBON DIOXIDE
pH Control Systems Using Carbon Dioxide,
W79-00365 5D

CARBON RADIOISOTOPES
Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

CARCINOGENESIS
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

CARCINOGENS
Criteria Document for DDT.
W79-00276 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

CARDIOVASCULAR MORTALITY
Water Hardness and Cardiovascular Mortality,
W79-00171 5C

CARP
Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions (In Russian),
W79-00180 2H

CATION EXCHANGE
Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

CATIONS
Evaluation of Donnan Dialysis for the Enrichment of Cations,
W79-00434 5A

CATTAILS
Cattails (Typha Spp.)--Weed Problem or Potential Crop.,
W79-00198 2I

CENSUS
Wetlands as a Naval Environmental Concern,
W79-00201 6G

CENTRAL AFRICAN PLATEAU
A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

CHANNELIZATION
Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

CHARLES (MA)
The Demand for Clean Water: The Case of tne Charles River,
W79-00234 6B

CHELATION
Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,
W79-00052 5F

Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

CHEMICAL ANALYSIS
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

Groundwater Quality Atlas of Nebraska,
W79-00252 7C

Automated Determination of Selenium in Water,
W79-00261 5A

Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples,
W79-00287 5A

CHEMICAL DEGRADATION
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

CHEMICAL FEED PUMPS
Water Treatment: Iron, Boiler Water and Water Analysis.
W79-00176 5F

CHEMICAL INHIBITORS (PLANTS)
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

CHEMICAL PRECIPITATION
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

CHEMICAL PROPERTIES
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

CHEMICAL REACTION
Low Toxic Corrosion Inhibitors for Aluminum in Fresh Water,
W79-00091 8G

CHEMICAL REACTIONS
Evaluation of Donnan Dialysis for the Enrichment of Cations,
W79-00434 5A

Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

CHEMICAL WASTES
Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,
W79-00151 5G

Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

CHEMICALS
The Biological Effects of Toxic Material Spills,
W79-00344 5C

CHEMOTAXIS
Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

CHERNOZEMS
Reclamation of Meadow-Chernozem Solonetzes of the Kustanai Oblast, (In Russian),
W79-00395 2G

CHESAPEAKE BAY
Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

CHICAGO (ILL)
Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanitary District of Greater Chicago, Lower Des Plaines Tunnel System.
W79-00465 5D

CHINOOK SALMON
Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,
W79-00428 8I

CHLORIDES
On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
W79-00372 5F

CHLORINATED HYDROCARBON PESTICIDES
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

Criteria Document for DDT.
W79-00276 5A

Criteria Document for Toxaphene.
W79-00281 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

PCB in Water, A Bibliography, Volume 3.
W79-00305 5A

CHLOROFLUOROCARBON
Chlorofluorocarbons as Hydrologic Tracers A New Technology,
W79-00461 5A

CHLOROPHYLL
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

CHOWAN RIVER BASIN (NC)
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

CHROMIUM
Controls Drive Platers to Materials Recovery,
W79-00154 5D

The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

CHRYSOTILE
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe,
W79-00435 5B

Investigation of Rainwater for the Presence of Asbestos,
W79-00437 5A

CITIES
Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,
W79-00328 2B

Residential Water Conservation,
W79-00440 3D

CLADOSPORIUM
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
W79-00297 2H

CLAMS
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

CLARIFIERS
Clarifier With Suspended Layer of Sediment (Osvetlitel' so vzveshennym sloem osadka),
W79-00421 5D

CLASSIFICATION
Optical Classification of Natural Waters,
W79-00318 2L

CLAYEY
Rational Determination of Underdrainage System from the Hydraulic Point of View: Studies on Underdrainage of Clayey Paddy Soil: III. (In Japanese),
W79-00199 2G

CLAYS
Water Relations of Fritted Clays,
W79-00476 2G

Seepage Control by Particle Size Selection,
W79-00484 4A

CLIMATOLOGY
Climatology of Instantaneous Rainfall Rates,
W79-00327 2B

CLOCK-HOURLY PRECIPITATION
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

CLOCK TWO-HOURLY PRECIPITATION
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

CLOSED-CYCLE COOLING
Wet Cooling Tower Backfitting Economics,
W79-00233 5G

CLOUD PHYSICS
Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

COAGULATION
Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

COAL POWERPLANTS
Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

COALS
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

COASTS
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

COFFERDAMS
Allowing for the Water Permeability of Frozen Ground Screens During their Formation,
W79-00467 8D

COLD WEATHER CONSTRUCTION
Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

COLIFORMS
Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water,
W79-00444 5A

COLLOIDS
Functions and Properties of Drilling Mud.
W79-00186 8G

COLOR
Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

Process for Purifying Aqueous Industrial Effluents.
W79-00399 5D

COLORADO
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,
W79-00140 4C

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

COLORADO PLATEAU
Regional Geology Series: Part VII, The Colorado Plateau,
W79-00177 8B

COLORADO RIVER
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

COLORADO RIVER BASIN
Reject Stream Replacement Study.
W79-00092 3A

COLORADO RIVER STORAGE
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

COMMERCIAL FISHING
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

COMMUNITY DEVELOPMENT
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

COMMUNITY POWER
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

COMPARATIVE BENEFITS
Critical Analysis of Flotation Performance,
W79-00376 5D

COMPOSITE MEMBRANES
Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis,
W79-00300 3A

COMPOUND CHANNEL
Momentum Transfer in a Compound Channel,
W79-00334 8B

COMPUTER MODELS
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

CONDENSATES
Steam Stripping Reduces Condensate at Weyco Mill,
W79-00409 3E

CONDENSATION
Nekoosa Cleans Condensates with Steam Distillation,
W79-00162 5D

CONFERENCES
Research to Anticipate Environmental Impacts of Changing Resource Usage.
W79-00085 6G

CONJUNCTIVE USE
Conjunctive Use of Ground and Surface Water,
W79-00170 4B

CONNATE WATER
Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh,
W79-00338 2L

CONNECTICUT
The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
W79-00441 2L

CONSERVATION
Protection of Outdoor Recreation Values of Rivers.
W79-00093 6B

Residential Water Conservation,
W79-00440 3D

CONSTRUCTION COSTS
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

Cost Estimates for Construction of Publicly-Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00248 5G

CONSUMPTIVE USE
Progress and Problems in the Study of Plant-Water Interrelations (In Bulgarian),
W79-00187 2I

CONTAMINATION (AIR)
Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

CONTINENTAL SHELF
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

CONTROL
Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

CONTROL SYSTEMS
Simple Sampler Activation and Recording System,
W79-00480 7B

CONTROLS
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

COOLING
Direct Cooling with Ground Water,
W79-00173 8C

Housing Project to Utilize Ground Water.
W79-00178 8C

COOLING TOWERS
Wet Cooling Tower Backfitting Economics,
W79-00233 5G

COPPER
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

CORN (FIELD)
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn,
W79-00500 2G

CORROSION CONTROL
Low Toxic Corrosion Inhibitors for Aluminum in Fresh Water,
W79-00091 8G

COST-BENEFIT ANALYSIS
Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

COST REPAYMENT
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

COSTA RICA
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

COSTS
Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

Wet Cooling Tower Backfitting Economics,
W79-00233 5G

Residential Water Conservation,
W79-00440 3D

COTTON
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

CRABS
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

CRITICISMS
An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery,
W79-00394 6E

CROP PRODUCTION
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters,
W79-00296 3F

CROP RESPONSE
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn,
W79-00500 2G

CROP VALUE
Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

CRYSTALLIZATION
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

CTENOPHARYNGODON IDELLA
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
W79-00207 4A

CULTIVATED LANDS
Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

CURRENTS (WATER)
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

CURVES
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

DAM FAILURE
Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

DAMINOZIDE
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

DAMS
Free-Surface Seepage Problem,
W79-00496 8D

DARKNESS
Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

DARTERS
Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,
W79-00277 7C

DATA COLLECTIONS
Data Base System for State Water Quality Management Information System.
W79-00222 5G

DBH
Microbial Degradation of DDT,
W79-00278 5C

DBP
Microbial Degradation of DDT,
W79-00278 5C

DDA
Microbial Degradation of DDT,
W79-00278 5C

DDM
Microbial Degradation of DDT,
W79-00278 5C

DDT
Criteria Document for DDT.
W79-00276 5A

Microbial Degradation of DDT,
W79-00278 5C

DEBRIS FLOW
Mechanical Characteristics of Debris Flow,
W79-00117 2J

DECISION-MAKING
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

The Development of the Electrical Power System in the Pacific Northwest, A Public Policy Perspective,
W79-00143 6E

Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

DEGRADATION (DECOMPOSITION)
Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

DELAWARE RIVER BASIN
Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

DEMAND
Residential Water Conservation,
W79-00440 3D

DEMINERALIZATION
Treatment of Water or Aqueous Systems,
W79-00039 5F

Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

DENITRIFICATION
Denitrifying Bacteria Can be Enumerated in Nitrite Broth,
W79-00498 2G

DENSITY CURRENTS
Internal Fronts in Two-Layer Flo,
W79-00486 8B

DEPARTMENT OF ENERGY RESEARCH
Summaries of Physical Research in the Geosciences.
W79-00101 10F

DESALINATION
Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater,
W79-00015 3A

Process for the Treatment of Water Solution by Ion Exchange,
W79-00054 5F

Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

Reject Stream Replacement Study.
W79-00092 3A

Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis,
W79-00300 3A

Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

High Temperature Elctrodialysis-Phase VI,
W79-00303 3A

Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

DESALINATION PLANTS
Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater,
W79-00015 3A

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

DESALINATION PROCESSES
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

DESIGN
Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants,
W79-00358 5D

DETERMINISTIC MODELING
Stormwater Modeling,
W79-00381 5B

DETRITUS
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

DEWATERING
Groundwater Pumping Techniques for Excavations and Other Works,
W79-00185 8G

Case History: Ash Disposal from an Oil Fried Central Station,
W79-00361 5E

Sludge Treatment by Supersonic Jet-Flame,
W79-00403 5E

DIALYSIS
Evaluation of Donnan Dialysis for the Enrichment of Cations,
W79-00434 5A

DIATOMS
Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

DIBENZOFURANS
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

DIEL CYCLES
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

DIEL MIGRATION
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

DIELDRIN
Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

DIFFUSION
Pollution of Groundwater Through Nonlinear Diffusion,
W79-00110 5B

DINOFLAGELLATES
Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

DISCHARGE (WATER)
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

Field Investigation of Selective Withdrawal,
W79-00119 4A

An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System,
W79-00131 2L

DISCOUNT RATES
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

DISINFECTANT
On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
W79-00372 5F

DISINFECTION
New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection,
W79-00369 5D

DISPERSION
Longitudinal Dispersion of Fluid Particles in Mountain Streams: I. Theory and Field Evidence,
W79-00308 5B

Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean Motion and Its Application,
W79-00309 5B

DISSOLVED ORGANIC CARBON
Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

DISSOLVED OXYGEN
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

Effects of Dissolved Oxygen in the Oxygenation Activated Sludge Process,
W79-00351 5D

DISTILLATION
Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater,
W79-00015 3A

Water Distiller with Cone Shaped Condenser,
W79-00045 5F

Nekoosa Cleans Condensates with Steam Distillation,
W79-00162 5D

DISTRIBUTION
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

DIVERSITY
Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,
W79-00277 7C

DOMINANT ORGANISMS
Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

DOOR COUNTY
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

DRAINAGE
Rational Determination of Underdrainage System from the Hydraulic Point of View: Studies on Underdrainage of Clayey Paddy Soil: III. (In Japanese),
W79-00199 2G

DRAWDOWN
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

DREDGE SPOIL
Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

DREDGING
Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations,
W79-00286 5A

Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

DREISSENA
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,
W79-00068 5C

DRILLING
Water Analytical Data as a Tool in Drilling and Production Economics,
W79-00168 8G

Regional Geology Series: Part VII, The Colorado Plateau,
W79-00177 8B

DRILLING FLUIDS
Functions and Properties of Drilling Mud.
W79-00186 8G

DRIP IRRIGATION
Drip Irrigation System,
W79-00038 3F

DROPS (FLUIDS)
Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

DROUGHT RESISTANCE
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

DROUGHT TOLERANCE
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

DRY MATTER
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

DUNES
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

DURATION CURVES
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

DUSTS
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

DYES
Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
W79-00053 5D

Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

DYNAMIC PROGRAMMING
Dynamic Programming and the Principle of Optimality: A Systematic Approach,
W79-00396 6A

EARTHWORMS
Effects of Municipal Sewage Effluent Irrigation on the Trace Metal Content of Earthworms,
W79-00009 5C

ECOLOGY
Research to Anticipate Environmental Impacts of Changing Resource Usage.
W79-00085 6G

Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

ECONOMIC EFFICIENCY
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

ECONOMIC IMPACT
Economic Impacts of Pulp and Paper Industry Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry Impact Analyses.
W79-00430 6E

A Model for Evaluating Alternative Land Developments Around Lakes,
W79-00460 4C

ECONOMICS
Heat Pump Accessories Can Save You Money,
W79-00174 8C

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Wet Cooling Tower Backfitting Economics,
W79-00233 5G

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

COSYSTEMS
The Biological Effects of Toxic Material Spills,
W79-00344 5C

DDIES
Eddy Production Inside Wall Layers,
W79-00333 8B

FFECTS
Lake Superior Regulation Effects,
W79-00388 4C

Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanitary District of Greater Chicago, Lower Des Plaines Tunnel System.
W79-00465 5D

FFLUENTS
A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

LECTRIC POWERPLANTS
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

LECTRICAL CONDUCTANCE
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

LECTRICAL POWER SYSTEM
The Development of the Electrical Power System in the Pacific Northwest, A Public Policy Perspective,
W79-00143 6E

LECTROCHEMISTRY
Continuous Electrochemical Synthesis Using a Packed Granular Electrode,
W79-00432 5D

LECTRODES
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

Continuous Electrochemical Synthesis Using a Packed Granular Electrode,
W79-00432 5D

LECTRODIALYSIS
Controls Drive Platers to Materials Recovery,
W79-00154 5D

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

High Temperature Elctrodialysis-Phase VI,
W79-00303 3A

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka),
W79-00417 5A

ELECTROFISHING
Nonmetallic Electrofishing Booms and Accessory Tackle,
W79-00069 7B

ELECTROLYSIS
Battery Operated Water Purification System,
W79-00043 5F

On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
W79-00372 5F

ELECTRON MICROSCOPY
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

ELY
Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota,
W79-00102 5D

EMISSION STANDARDS
The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

EMULSIONS
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

ENERGY
Energy Conservation and Outdoor Recreation,
W79-00096 6G

Looking at the Positive Side of Energy Regulation,
W79-00411 3E

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

Resource Analysis: Water and Energy as Linked Resources,
W79-00453 6D

ENERGY CONSERVATION
Energy Conservation and Outdoor Recreation,
W79-00096 6G

How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer),
W79-00418 3E

ENERGY CONSUMPTION
Energy Conservation and Outdoor Recreation,
W79-00096 6G

Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota,
W79-00102 5D

ENERGY CRISIS
A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

ENERGY POLICY
A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

ENERGY SUPPLY
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

ENGINEERING
Stochastic Processes in Water Resources Engineering.
W79-00380 8B

ENGLAND
An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

ENTERIC BACTERIA
Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water,
W79-00444 5A

ENTITLEMENTS
Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

ENTRAINMENT
Vortex Formation at Vertical Pipe Intakes,
W79-00485 8B

ENVIRONMENT
Economic Impacts of Pulp and Paper Industry Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry Impact Analyses.
W79-00430 6E

ENVIRONMENTAL CONTROL
Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

ENVIRONMENTAL CONVERGENCE
On the Environmental Efficiency of Economic Systems,
W79-00230 6G

ENVIRONMENTAL ECONOMICS
Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

ENVIRONMENTAL EFFECTS
Research to Anticipate Environmental Impacts of Changing Resource Usage.
W79-00085 6G

On the Environmental Efficiency of Economic Systems,
W79-00230 6G

ENVIRONMENTAL ENHANCEMENT
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

ENVIRONMENTAL POLLUTION
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

ENVIRONMENTAL RESOURCES
Public Outdoor Recreation Benefits of Federal Water Resource Projects.
W79-00094 6E

ENZYMES
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

EPIPELIC ALGAE
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

EQUITY
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

EROSION
Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

EROSION RATES
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumulations,
W79-00495 2J

ESTERS
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

ESTIMATED COSTS
Cost Estimates for Construction of Publicly-Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00248 5G

ESTIMATING
Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

ESTUARIES
On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System,
W79-00131 2L

Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
W79-00441 2L

Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,
W79-00488 2L

On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System,
W79-00497 2L

ETHYLENE
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters,
W79-00296 3F

EUROPE
Acid Precipitation in the Netherlands,
W79-00138 5A

EUTROPHICATION
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

EVALUATION
Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

EVAPORATION
A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

EVAPOTRANSPIRATION
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

EXCAVATION
Groundwater Pumping Techniques for Excavations and Other Works,
W79-00185 8G

EXTERNALITIES
Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

FALLOUT
Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

FEDERAL CONSTRUCTION GRANT PROGRAM
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

FEDERAL FUNDS
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

Cost Estimates for Construction of Publicly-Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00248 5G

FERRIC OXIDE
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

ERTILIZATION
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn,
W79-00500 2G

ERTILIZERS
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn,
W79-00500 2G

LTRATION
Water -- 1977.
W79-00342 5D

New Developments in Oil Interception by Filtration,
W79-00364 5D

Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

INITE DIFFERENCE ANALYSIS
Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

INITE DIFFERNCE ANALYSIS
Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

INITE ELEMENT ANALYSIS
Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media,
W79-00135 2F

INITE ELEMENT MODEL
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

ISH
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho,
W79-00427 5C

FISH DIETS
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

FISH DISEASES
A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water,
W79-00455 5G

FISH HATCHERIES
A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water,
W79-00455 5G

FISH MANAGEMENT
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

FISH PHYSIOLOGY
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park,
W79-00082 5C

FISH POPULATIONS
Collection Bucket for Use with Tow Nets for Larval Fish,
W79-00070 7B

FISH STAMINA
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

FISH TISSUE RESPIRATION
A Comparative In Vitro Study of the Effects of Various Balanced Saline Solutions on Respiration Rates of Liver Tissues of Three Fish Species,
W79-00454 5C

FISHERIES
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery,
W79-00394 6E

FISHES
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

FISSURES (GEOLOGIC)
Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

FJORDS
Mixing in an Arctic Fjord,
W79-00487 2L

FLAME PHOTOMETRY
Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva),
W79-00415 5A

FLASH FLOODS
Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

FLOCCULATION
Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

FLOOD CONTROL
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

Lake Level Control and Management--A Case Study,
W79-00390 4A

FLOOD CONTROL

Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

FLOOD DATA

Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

FLOOD DISCHARGE

Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

FLOOD PLAINS

Flood Regions in Jamaica,
W79-00330 2E

Momentum Transfer in a Compound Channel,
W79-00334 8B

FLOOD REGIONS

Flood Regions in Jamaica,
W79-00330 2E

FLOOD WAVES

Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

FLOODS

Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

Flood Regions in Jamaica,
W79-00330 2E

FLOODWATER

Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

FLORIDA

Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

Vegetation of Southeastern Florida -- Parts II - V,
W79-00196 2I

Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

FLOTATION

Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

Factors Influencing Induced Air Flotation,
W79-00375 5D

Critical Analysis of Flotation Performance,
W79-00376 5D

Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

FLOW

Measurements of Bed Load in Oscillatory Flow,
W79-00141 2J

Air Entrainment in Radial Flow Towards Intakes,
W79-00315 8B

Internal Fronts in Two-Layer Flo,
W79-00486 8B

On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System,
W79-00497 2L

FLOW CONTROL

Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,
W79-00031 3F

Drip Irrigation System,
W79-00038 3F

FLOW DURATION

Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

FLOW MEASUREMENT

The Vertical Planar Motion Mechanism; A Dynamic Test Apparatus for Evaluating Current Meters and Other Marine Instrumentation,
W79-00224 7B

Shunt Meters with Segmental Orifices,
W79-00335 3F

FLOW RATES

Low-Flow Characteristics of Oklahoma Streams,
W79-00257 2E

FLOWMETERS

The Vertical Planar Motion Mechanism; A Dynamic Test Apparatus for Evaluating Current Meters and Other Marine Instrumentation,
W79-00224 7B

FLUCTUATIONS

Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

FLUMES

Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

FLUOBORATE

Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

FLUORIDES

Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,
W79-00151 5G

FLUSHING RATE

Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

FLY ASH

Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

FOREIGN COUNTRIES

Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

FOREST FIRES

Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

FOREST MANAGEMENT

Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

FOREST SOILS

Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,
W79-00140 4C

Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

FOREST WATERSHEDS

Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

FORESTRY

Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

FORESTS

Summary of Study Findings, Phase I Report: Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands,
W79-00195 4C

FOSSIL FUELS

Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants,
W79-00358 5D

FRAINS LAKES (MI)

Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

FRAZIL ICE

Frazil Ice Formation: A Review,
W79-00120 2C

FREE RADICAL

Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

FREQUENCY ANALYSIS
High-Flow Frequencies for Selected Streams in Oklahoma,
W79-00273 2E

FREQUENCY CURVES
Climatology of Instantaneous Rainfall Rates,
W79-00327 2B

FRESHWATER FISH
Nonmetallic Electrofishing Booms and Accessory Tackle,
W79-00069 7B

Collection Bucket for Use with Tow Nets for Larval Fish,
W79-00070 7B

Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

FRITTED CLAY
Water Relations of Fritted Clays,
W79-00476 2G

FROTH FLOTATION
Water -- 1977.
W79-00342 5D

Critical Analysis of Flotation Performance,
W79-00376 5D

FROZEN GROUND
Allowing for the Water Permeability of Frozen Ground Screens During their Formation,
W79-00467 8D

FULVIC ACIDS
Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

FUNGI
Microbial Degradation of DDT,
W79-00278 5C

FUNGICIDES
The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

FURROW IRRIGATION
Control of Furrow Infiltration by Compaction,
W79-00481 3F

FURROWS
Control of Furrow Infiltration by Compaction,
W79-00481 3F

GALVESTON
Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

GAMMA RAYS
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

The Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

GAS CHROMATOGRAPHY
Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

Chlorofluorocarbons as Hydrologic Tracers A New Technology,
W79-00461 5A

GASES
Transfer of Gases at Natural Air-Water Interfaces,
W79-00127 2L

Laboratory Studies of Gas Tracers for Reaeration,
W79-00270 5A

GASTROPODS
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),
W79-00083 5C

GENERAL RECLAMATION STATISTICS
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

GEOCHEMISTRY
The Isotope Hydrology of the Mereenie Sandstone Aquifer, Alice Springs, Northern Territory, Australia,
W79-00322 2F

Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

GEOPHYSICS
Summaries of Physical Research in the Geosciences.
W79-00101 10F

GEOTHERMAL STUDIES
Energy Conversion System,
W79-00037 4B

Process and System for Recovery of Energy from Geothermal Brines and Other Water Containing Sources by Direct Contact with a Working Fluid Below the Critical Pressure,
W79-00049 4B

Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park,
W79-00082 5C

Summaries of Physical Research in the Geosciences.
W79-00101 10F

Digging for New Sources of Energy.
W79-00175 8B

GOAL PROGRAMMING
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

GONYAULAX POLYEDRA
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

GRAPHICAL ANALYSIS
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

GRASSES
Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

GRAVEL PACKS
Water Well Development Decisions,
W79-00167 8B

GRAVELS
Seepage Control by Particle Size Selection,
W79-00484 4A

GRAVITY WAVES
Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

GREAT LAKES
Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

Generation and Propagation of Downwelling Fronts,
W79-00128 2H

Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,
W79-00339 5A

Lake Superior Regulation Effects,
W79-00388 4C

Hydraulics of Great Lakes Inlets,
W79-00469 8B

GREAT LAKES BASIN
Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,
W79-00339 5A

GREAT LAKES REGION
Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,
W79-00339 5A

GREAT PLAINS
Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

GREAT SALT LAKE
The Historic Level of Great Salt Lake, Utah,
W79-00264 2H

GREAT SALT LAKE (UTAH)
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
W79-00297 2H

GREEN ASH
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

GREEN RIVER BASIN (KY)
Operating Model for the Green River Basin Reservoir System,
W79-00452 4A

GROUNDWATER
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

Pollution of Groundwater Through Nonlinear Diffusion,
W79-00110 5B

Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00111 2F

Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

Kriging in the Hydrosciences,
W79-00134 2F

Direct Cooling with Ground Water,
W79-00173 8C

Regional Geology Series: Part VII, The Colorado Plateau,
W79-00177 8B

New Approach Gets Results in Utah Well,
W79-00181 8B

Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

Groundwater Quality Atlas of Nebraska,
W79-00252 7C

Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

Water Resources Data for Wisconsin, Water Year 1977.
W79-00267 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

Formation of a Vermiculite Mineral from Ground Water Components (In Russian),
W79-00382 2K

Hydrogeology of the Grande Prairie Area, Alberta,
W79-00470 2F

GROUNDWATER AVAILABILITY
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

GROUNDWATER CONTAMINATION
Oil-Troubled Water,
W79-00169 5B

GROUNDWATER MOVEMENT
On the Two-Dimensional Groundwater Movement,
W79-00108 2F

A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media,
W79-00135 2F

Oil-Troubled Water,
W79-00169 5B

Relationship of Rainfall and Lake Groundwater Seepage,
W79-00489 5B

GROUNDWATER RESOURCES
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

GROUNDWOOD MILLS
How Kind to the Resources is the Grinding Process. (Hvor ressursvennlig er slipeprosessen),
W79-00408 3E

GROWTH RATE
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

GROWTH RATES
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park,
W79-00082 5C

A Method of Measuring Bacterial Growth in Aquatic Environments Using Dialysis Culture,
W79-00109 5A

GULF OF MEXICO
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

GYMNODINIUM
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

HABITATS
Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,
W79-00428 8I

HAIL
Hailstone Size inferred from Dents in Cold-Rolled Aluminum Sheet,
W79-00139 7B

HALOPHILES
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
W79-00297 2H

HAMILTON MARSHES (NJ)
Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

HARDNESS
Water Hardness and Cardiovascular Mortality,
W79-00171 5C

HATCHERY-REARED ATLANTIC SALMON
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

HEAT PUMPS
Heat Pump Accessories Can Save You Money,
W79-00174 8C

Housing Project to Utilize Ground Water.
W79-00178 8C

HEAT TRANSFER
Energy Conversion System,
W79-00037 4B

Process and System for Recovery of Energy from Geothermal Brines and Other Water Containing Sources by Direct Contact with a Working Fluid Below the Critical Pressure,
W79-00049 4B

HEAT TREATMENT
Sludge Treatment by Supersonic Jet-Flame,
W79-00403 5E

HEATED WATER
Process and System for Recovery of Energy from Geothermal Brines and Other Water Containing Sources by Direct Contact with a Working Fluid Below the Critical Pressure,
W79-00049 4B

ology of Dreissena Polymorpha (Pall.) reissenidae, Bivalvia) in Lakes Receiving ated Water Discharges,
79-00068 5C

TING
at Pump Accessories Can Save You Money,
79-00174 8C

using Project to Utilize Ground Water.
79-00178 8C

VY METALS
e Effects of Heavy Metals on Algae Popula-ns in a South Central Reservoir,
79-00011 5C

aluation of Donnan Dialysis for the En-nment of Cations,
79-00434 5A

aching Characteristics of Various Heavy tals, Non-Heavy Metals and Anions from nicipal Sewage Sludge Ash,
79-00459 5B

H FLOW
gh-Flow Frequencies for Selected Streams in lahoma,
79-00273 2E

HWAY EFFECTS
mmary of Study Findings, Phase I Report: ological Effects of Highway Construction on Michigan Woodlots and Wetlands,
79-00195 4C

STON
int Source Analysis. Inventory, Water De-nds, and Problem Area Identification. reawide Waste Treatment Plan for the eater Houston Area. Section 208, PL 92-500.
79-00104 6D

AN PATHOLOGY
ological Effects and Environmental Aspects 1,3-Butadiene,
79-00292 5C

IC ACIDS
vestigations of the Molecular Weight, Free dical and Metal Interactions of Isolated uatic and Soil Fulvic Acid,
79-00436 1B

RID RESINS
salination Process Using Thermally generable Resins,
79-00057 3A

RAULIC DESIGN
e Vertical Planar Motion Mechanism; A namic Test Apparatus for Evaluating Cur-t Meters and Other Marine Instrumentation,
79-00224 7B

RAULIC JUMP
ssure Fluctuations Beneath Submerged np,
79-00316 8B

RAULIC MODELS
e Vertical Planar Motion Mechanism; A namic Test Apparatus for Evaluating Cur-t Meters and Other Marine Instrumentation,
79-00224 7B

draulic Model Investigation of a Two-Way op Inlet for Floodwater Retarding Structure . 3, Banklick Creek Watershed, Boone and nton Counties, Kentucky,
79-00341 8B

HYDRAULIC STRUCTURES
Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

HYDRAULICS
Three-Dimensional Open Channel Flow,
W79-00312 8B

Stochastic Processes in Water Resources Engineering.
W79-00380 8B

Hydraulics of Great Lakes Inlets,
W79-00469 8B

HYDROELECTRIC POWER
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

HYDROGEN ION CONCENTRATION
pH Control Systems Using Carbon Dioxide,
W79-00365 5D

Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

HYDROGEN SULFIDE
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

HYDROGEOLOGY
Shortest Path Problems in Hydrogeology,
W79-00137 6A

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

Hydrogeology of the Grande Prairie Area, Alberta,
W79-00470 2F

HYDROLOGIC CYCLE
Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

HYDROLOGIC DATA
Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

Water Resources Data for Wisconsin, Water Year 1977.
W79-00267 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

HYDROLOGY
The Application of Linear Programming to Run-Off Management,
W79-00393 4A

A General Two Dimensional River Simulator,
W79-00397 2E

HYDROLYSIS
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

HYPERTENSION
Water Hardness and Cardiovascular Mortality,
W79-00171 5C

HYPHOMYCETES
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
W79-00297 2H

ICE
Frazil Ice Formation: A Review,
W79-00120 2C

Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00340 2C

ICE COVER
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00340 2C

ICE LOADS
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

ICEBREAKERS
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

IDAHO
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho,
W79-00427 5C

Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,
W79-00428 8I

ILLINOIS
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanitary District of Greater Chicago, Lower Des Plaines Tunnel System.
W79-00465 5D

ILLINOIS RIVER
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

IMPERVIOUS MEMBRANE
Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

IMPERVIOUS MEMBRANES
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

IMPOUNDMENT IMPACTS
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River Canyon, Washington,
W79-00146 6G

IMPOUNDMENT STUDY
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

INCINERATION
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

INDIA
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

INDIAN WELLS VALLEY
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

INDIANA
A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

INDUSTRIAL CHEMICALS
Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

INDUSTRIAL WASTE
Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

New Developments in Oil Interception by Filtration,
W79-00364 5D

INDUSTRIAL WASTES
Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Treatment of Effluent,
W79-00024 5D

Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping Through Soil Containing Said Water,
W79-00034 5G

Clarification Process,
W79-00041 5D

Color Removal Process,
W79-00042 5D

Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
W79-00053 5D

Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

Water -- 1977.
W79-00342 5D

Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation,
W79-00350 5D

Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

Pretreatment of Industrial Wastes with Ozone,
W79-00368 5D

INDUSTRIAL WATER
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

INFECTIOUS BOVINE RHINOTRACHEITIS VIRUS
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

INFECTIOUS BOVINRE RHINOTRACHEITIS
B. R. /Hanson ;I. A. /Schipper
W79-00150 5C

INFILTRATION
Steady Infiltration from Single and Periodic Strip Sources,
W79-00471 2G

Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications,
W79-00472 2G

INFILTRATION RATES
Control of Furrow Infiltration by Compaction,
W79-00481 3F

INFORMATION RETRIEVAL
Data Base System for State Water Qual
Management Information System.
W79-00222

INHIBITION
The Effect of Cyclohexane Derivatives
Selection of Bacterial Groups Forming
tivated Sludge Microflora,
W79-00159

INLET-HARBOR RESONANCE
Hydraulics of Great Lakes Inlets,
W79-00469

INLETS (WATERWAYS)
Hydraulics of Great Lakes Inlets,
W79-00469

INSECTS
Control of Aquatic Weed by Moth Larvae,
W79-00197

Biocenosis of a High Mountain Stream Un
the Influence of Tourism. 4. The Bottom Fa
of the Stream Rybi Potok (The High Ta
Mts),
W79-00221

Biologically Active Substances in Pulp
Waste Liquors. I. Substances Active Aga
Termites, Coptotermes Formosanus Shiraki
Kraft Pulping and Bleaching Wastes,
W79-00404

INSTRUMENTATION
Solid State Event Recorder for Rainfall M
surement,
W79-00125

A Comparison of Ceramic and Teflon in S
Samplers for Pore Water Determinations,
W79-00325

Shunt Meters with Segmental Orifices,
W79-00335

Instrumentation and Controls for Philadelp
Electric Company Eddystone Generating S
tion Wastewater Treatment System,
W79-00357

Simple Sampler Activation and Record
System,
W79-00480

INTAKES
Air Entrainment in Radial Flow Towards
takes,
W79-00315

Vortex Formation at Vertical Pipe Intakes,
W79-00485

INTER-AGENCY COOPERATION
Remote Monitoring of Coal Strip Mine Re
bilitation,
W79-00226

INTERNAL WAVES
Internal Fronts in Two-Layer Flo,
W79-00486

INTERNATIONAL AGENCIES
An Analysis of Criticisms of Internatio
Fishery Organizations with Reference to Th
Agencies Associated with the Canadian W
Coast Fishery,
W79-00394

IVERTEBRATES
Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs,
W79-00074 7B

Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

VESTMENT
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

YO COUNTY
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

N EXCHANGE
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

Evaluation of Donnan Dialysis for the Enrichment of Cations,
W79-00434 5A

N EXCHANGE RESINS
Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

N FLOTATION
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

NIZATION
Factors Influencing Induced Air Flotation,
W79-00375 5D

NIZING RADIATION
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

NS
on Selective Electrodes in Water Quality Analysis,
W79-00223 5A

AN
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

IRON
Water Treatment: Iron, Boiler Water and Water Analysis.
W79-00176 5F

IRON OXIDES
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

IRON REMOVAL
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

IRRADIATION
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

The Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

IRRIGABLE LAND
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

IRRIGATED SOILS
Irrigated Soils of the Milskaya Plain (In Russian),
W79-00060 2G

IRRIGATION
Angularity Sensor Means for Center Pivot Irrigation System,
W79-00023 3F

Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,
W79-00031 3F

Two-Step Roll Ahead Irrigation System,
W79-00032 3F

Drip Irrigation System,
W79-00038 3F

Aboveground Sprinkling Device for Sprinkling System,
W79-00059 3F

Correlation Between the Salt Content in the Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irrigation, (In Russian),
W79-00203 2G

Shunt Meters with Segmental Orifices,
W79-00335 3F

Survival and Early Growth of Selected Trees on Waste Water Application Sites,
W79-00422 5E

IRRIGATION DESIGN
Pipe Sizes from Modified Moody Diagram,
W79-00499 3F

IRRIGATION EFFECTS
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

IRRIGATION EFFICIENCY
Angularity Sensor Means for Center Pivot Irrigation System,
W79-00023 3F

Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,
W79-00031 3F

Two-Step Roll Ahead Irrigation System,
W79-00032 3F

Drip Irrigation System,
W79-00038 3F

Irrigation Efficiency, A Bibliography, Volume 3.
W79-00307 3F

IRRIGATION PRACTICES
Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,
W79-00031 3F

IRRIGATION PROGRAMS
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

IRRIGATION SYSTEMS
Angularity Sensor Means for Center Pivot Irrigation System,
W79-00023 3F

Two-Step Roll Ahead Irrigation System,
W79-00032 3F

Drip Irrigation System,
W79-00038 3F

Aboveground Sprinkling Device for Sprinkling System,
W79-00059 3F

ISOTOPE STUDIES
The Isotope Hydrology of the Mereenie Sandstone Aquifer, Alice Springs, Northern Territory, Australia,
W79-00322 2F

JAMAICA
Flood Regions in Jamaica,
W79-00330 2E

JOHNSTOWN AREA
Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

JURISDICTION
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

KALMAN FILTER
Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

KARA-KUM CANAL
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
W79-00207 4A

KENTUCKY
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

Operating Model for the Green River Basin Reservoir System,
W79-00452 4A

KEPONE
Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

KERN COUNTY
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

KINETICS
Stormwater Modeling,
W79-00381 5B

KISSIMMEE RIVER BASIN (FLA)
Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

LABORATORY EQUIPMENT
Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
W79-00071 7B

LABORATORY TESTS
Scour of Bed Material in Very Rough Channels,
W79-00122 2J

Measurements of Bed Load in Oscillatory Flow,
W79-00141 2J

Automated Determination of Selenium in Water,
W79-00261 5A

A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations,
W79-00325 5A

Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

LAGOON OF ALVARADO (MEX)
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

LAGOONS
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

LAKE ALICE (FL)
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

LAKE ERIE
Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

LAKE EVAPORATION
A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

LAKE FAYETTEVILLE (ARK)
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

LAKE MANAGEMENT
Lake Level Control and Management--A Case Study,
W79-00390 4A

LAKE MICHIGAN
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

LAKE OF ZURICH
On the Vertical Distribution and Seasonal Development of the Density of Dreissena Polymorpha Larvae in the Pelagic Zone of the Lake of Zurich (In German),
W79-00280 5F

LAKE ONTARIO
Generation and Propagation of Downwelling Fronts,
W79-00128 2H

LAKE SUPERIOR
Lake Superior Regulation Effects,
W79-00388 4C

LAKE WASHINGTON (WA)
Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

LAKE WATER CHEMISTRY
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

LAKES
Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,
W79-00321 5A

A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

Relationship of Rainfall and Lake Groundwater Seepage,
W79-00489 5B

LAND AND WATER CONSERVATION FUND (LWCF)
Federal Outdoor Recreation Land Acquisition-LWCF.
W79-00095 6E

LAND DEVELOPMENT
Federal Outdoor Recreation Land Acquisition-LWCF.
W79-00095 6E

LAND DRAINAGE
Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

LAND MANAGEMENT
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

Federal Outdoor Recreation Land Acquisition-LWCF.
W79-00095 6E

Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

LAND RECLAMATION
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

LAND RESOURCES
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

LAND SUBSIDENCE
Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

LAND USE
Soil, Water and Air Sciences Research.
W79-00105 2G

The Application of Linear Programming to Run-Off Management,
W79-00393 4A

LAND-USE MODEL
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

LANDFILLS
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

ANDSAT
Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

ANDSAT I IMAGERY
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

ARVAE
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

Control of Aquatic Weed by Moth Larvae,
W79-00197 4A

ARVAL GROWTH STAGES
Collection Bucket for Use with Tow Nets for Larval Fish,
W79-00070 7B

ATERITES
Rural Water Supplies from Laterite Runoff,
W79-00387 5F

AUREL RUN RESERVOIR DAM
Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

AW ENFORCEMENT
A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

EACHATE
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

EACHATES
Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

EACHING
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

EACHING CHARACTERISTICS
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

EAD
Environmental Effects of Schuylkill Oil Spill I, June 1972.
W79-00294 5C

EGISLATION
Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

Looking at the Positive Side of Energy Regulation,
W79-00411 3E

LETHAL LIMIT
Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

LIABILITY
Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

LIGNINS
The Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

LIMITING FACTORS
Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

LINEAR FLOW MODEL
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

LINEAR PROGRAMMING
The Application of Linear Programming to Run-Off Management,
W79-00393 4A

LININGS
Seepage Control by Particle Size Selection,
W79-00484 4A

LIQUID WASTES
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

LITTLE PORT WALTER (ALA)
Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
W79-00071 7B

LOAM
Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2G

LOCAL GOVERNMENT
Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

LOTIC ENVIRONMENT
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

LOUISIANA
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

LOW FLOW
Low-Flow Characteristics of Oklahoma Streams,
W79-00257 2E

Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

LUMBERING
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,
W79-00140 4C

Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

LYSIMETER STUDIES
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

LYSIMETRY
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

MACROPHYTES
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

MAGNESIUM
Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva),
W79-00415 5A

MAINTENANCE COSTS
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

MANAGEMENT
Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery,
W79-00394 6E

MANGANESE
Water Treatment: Iron, Boiler Water and Water Analysis.
W79-00176 5F

MANGROVE SWAMPS
The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

MAPPING
Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

MAPS
Groundwater Quality Atlas of Nebraska,
W79-00252 7C

Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

MARINE MICROORGANISMS
Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

MARSHES
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

MASS TRANSFER
Transfer of Gases at Natural Air-Water Interfaces,
W79-00127 2L

MATERIALS
Water Relations of Fritted Clays,
W79-00476 2G

MATHEMATICAL MODELS
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

On the Two-Dimensional Groundwater Movement,
W79-00108 2F

Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

Kriging in the Hydrosciences,
W79-00134 2F

Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,
W79-00352 5D

Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Lake Superior Regulation Effects,
W79-00388 4C

Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

Steady Infiltration from Single and Periodic Strip Sources,
W79-00471 2G

Simple Model for Ocean Outfall Plumes,
W79-00479 5B

Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
W79-00491 2A

Climate Change: Detection and Its Impact on Hydrologic Design,
W79-00492 2E

Free-Surface Seepage Problem,
W79-00496 8D

MAYFLIES
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera),
W79-00076 5G

MEADOWS
Wet Meadows in Southern Sweden: Vegetation, Succession and Management (In Swedish),
W79-00288 2I

MEANDERING STREAMS
Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

MEASUREMENT
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

Hailstone Size inferred from Dents in Cold-Rolled Aluminum Sheet,
W79-00139 7B

MEKONG DELTA
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

MEMBRANE ADSORPTION PROCEDURE
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

MEMBRANE PROCESSES
Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis,
W79-00300 3A

Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

High Temperature Elctrodialysis-Phase VI,
W79-00303 3A

Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

MEMBRANES
Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka),
W79-00417 5A

MERCURY
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

Multimedia Levels--Mercury,
W79-00291 5B

METABOLISM
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

METHOD OF CHARACTERISTICS
Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

METHODOLOGY
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
W79-00075 8I

On the Environmental Efficiency of Economic Systems,
W79-00230 6G

Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

ETOROLOGY
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

EXICAN WATER TREATY
Reject Stream Replacement Study.
W79-00092 3A

EXICO
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

CROBIAL DEGRADATION
Method for Depolluting Fresh and Sea Water from Petroleum Products,
W79-00058 5G

Microbial Degradation of DDT,
W79-00278 5C

CROCYSTIS AERUGINOSA
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
W79-00207 4A

LITARY RESERVATIONS
Wetlands as a Naval Environmental Concern,
W79-00201 6G

LSKAYA PLAIN (USSR)
rrigated Soils of the Milskaya Plain (In Russian),
W79-00060 2G

NE WASTES
ish and Wildlife Inventory of the Seven-County Region Included in the Central Florida hosphate Industry Area-Wide Environmental mpact Study. Volumes I and II,
W79-00100 5C

quatic Inhabitants of a Mine Waste Stream in rizona,
W79-00426 5C

ydrochemical Influences on the Fishery ithin the Phosphate Mining Area of Eastern aho,
W79-00427 5C

IMAL SPANNING TREE
ortest Path Problems in Hydrogeology,
W79-00137 6A

SISSIPPI
anges in Interstitial Water Salinity of a Mississippi Tidal Marsh,
W79-00338 2L

MISSOURI RIVER
Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

MIXING
Mixing in an Arctic Fjord,
W79-00487 2L

MIXING ZONES
The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
W79-00441 2L

MODEL STUDIES
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

On the Two-Dimensional Groundwater Movement,
W79-00108 2F

Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00111 2F

Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

Transfer of Gases at Natural Air-Water Interfaces,
W79-00127 2L

Generation and Propagation of Downwelling Fronts,
W79-00128 2H

Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System,
W79-00131 2L

Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

Kriging in the Hydrosciences,
W79-00134 2F

A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media,
W79-00135 2F

Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

Simulation of Flows in Ungaged Basins,
W79-00331 2E

Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,
W79-00352 5D

Stormwater Modeling,
W79-00381 5B

Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price,
W79-00438 6A

A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

River Temperature Variation with Freezing and Storage,
W79-00477 2E

Total Phosphorus Transport During Storm Events,
W79-00478 5B

Control of Water Residence Time in Small Reservoirs,
W79-00482 4A

Vortex Formation at Vertical Pipe Intakes,
W79-00485 8B

Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
W79-00491 2A

Climate Change: Detection and Its Impact on Hydrologic Design,
W79-00492 2E

Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

MODEL STUDIES

Free-Surface Seepage Problem,
W79-00496 8D

On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System,
W79-00497 2L

MOISTURE
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

MOISTURE AVAILABILITY
Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

MOISTURE BLOCKS
Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2G

MOISTURE DEFICIT
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

MOISTURE STRESS
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

MOLECULAR FRACTIONATION
Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

MOLECULAR WEIGHT
Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

MOLLUSKS
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,
W79-00068 5C

MOLTING
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

MOMENTUM
Momentum Transfer in a Compound Channel,
W79-00334 8B

MONITORING
Aquatic Biotal Monitor,
W79-00033 5A

Remote Water Monitoring System,
W79-00047 7B

Automatic System Cleaner for Remote Monitor,
W79-00051 5A

Collection Bucket for Use with Tow Nets for Larval Fish,
W79-00070 7B

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

MOODY RESISTANCE DIAGRAM
Pipe Sizes from Modified Moody Diagram,
W79-00499 3F

MORTALITY
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

MOUND SPRINGS
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

MOUNTAINS
Longitudinal Dispersion of Fluid Particles in Mountain Streams: I. Theory and Field Evidence,
W79-00308 5B

Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean Motion and Its Application,
W79-00309 5B

Origin and Transport of Large Boulders in Mountain Streams,
W79-00490 2J

MULLETS
Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

MULTIMEDIA DEEP BED FILTRATION (MMDB)
New Developments in Oil Interception by Filtration,
W79-00364 5D

MULTIPLE PURPOSE
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

MULTIPLE-PURPOSE RESERVOIRS
Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

MUNICIPAL SEWAGE SLUDGE INCINERATOR ASH
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

MUNICIPAL SEWAGE TREATMENT
Resource Analysis: Water and Energy as Linked Resources,
W79-00453 6D

MUNICIPAL WASTE
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

MUNICIPAL WASTES
Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

MUNICIPAL WATER
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

Resource Analysis: Water and Energy as Linked Resources,
W79-00453 6D

MUSSELS
On the Vertical Distribution and Seasona Development of the Density of Dreissena Polymorpha Larvae in the Pelagic Zone of the Lake of Zurich (In German),
W79-00280 5I

MUTAGENS
Preliminary Study of Selected Potential En vironmental Contaminants - Optica Brighteners, Methyl Chloroform, Tri Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

NAPHTHALENES
The Effect of Naphthalene on Survival and Ac tivity of the Amphipod Parhyale,
W79-00081 5C

NATIONAL PARKS
Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5I

NATIONAL WATER COMMISSION
The National Water Commission Revisited Per spective on National Water Policy Studies with some Implications for Changes in Futur Water Policy,
W79-00383 6I

NATURAL RESOURCE ECONOMICS
Natural Resource Economics: The Upsettin Discipline,
W79-00242 6I

NATURAL RESOURCES
Soil, Water and Air Sciences Research.
W79-00105 2C

NATURAL STREAMS
Momentum Transfer in a Compound Channel,
W79-00334 8I

NEBRASKA
Groundwater Quality Atlas of Nebraska,
W79-00252 7C

Ground-Water Availability in the Hitchcock Red Willow, Frenchman Valley, and Meeker Driftwood Irrigation Districts, Southwes Nebraska,
W79-00260 4I

NEUTRALIZATION
Sea-Water Neutralization of Effluents from th Industrial Processing of Phosphorite. A Cas Study in the Practical Use of Basic Knowledg in Analytical and Marine Chemistry,
W79-00151 5C

NEW ENGLAND
The Feasibility of Using Forest Lands fo Recycling Sludge Nutrients in Northern Nev England,
W79-00446 5I

NEW HAMPSHIRE
The Feasibility of Using Forest Lands fo Recycling Sludge Nutrients in Northern Nev England,
W79-00446 5I

EW ZEALAND
Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2G

EWTS
The Toxicity of Manganese Ethylenebisdithiocarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

ICKEL
Controls Drive Platers to Materials Recovery,
W79-00154 5D

IGERIA
Rural Water Supplies from Laterite Runoff,
W79-00387 5F

TRATE NITROGEN FLUX
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

TRATE REDUCTASE
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,
W79-00149 2I

TRATES
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn,
W79-00500 2G

TRIFICATION
Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5D

Aerobic Media Trickling Filter Applied to Nitrogen Control,
W79-00445 5D

TRITES
Denitrifying Bacteria Can be Enumerated in Nitrite Broth,
W79-00498 2G

TROGEN
Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

N-POINT POLLUTION SOURCES
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

NAGRICULTURAL LANDS
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.
W79-00193 3F

NPOINT POLLUTION
Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

NORTH CAROLINA
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

NUCLEAR WASTES
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

NUMERICAL ANALYSIS
Numerical Study of Continuous Saltation,
W79-00314 8B

NUTRIENT CYCLING
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

NUTRIENT LOADING
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

NUTRIENT REMOVAL
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

NUTRIENT REQUIREMENTS
Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

NUTRIENTS
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

OAK TREES
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

OBSERVATION WELLS
Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

OCEANS
Optical Classification of Natural Waters,
W79-00318 2L

Simple Model for Ocean Outfall Plumes,
W79-00479 5B

ODOR
Water -- 1977.
W79-00342 5D

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

OGALLAL FORMATION
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

OHIO
Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumulations,
W79-00495 2J

OHIO RIVER BASIN
Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

OIL
The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

Environmental Effects of Schuylkill Oil Spill II, June 1972.
W79-00294 5C

OIL INDUSTRY
The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

OIL POLLUTION
Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

Oil Fence,
W79-00036 5G

Belt Type Oil Removal Unit,
W79-00040 5G

Process and Apparatus for Separating Oil From Water Contaminated with Oil,
W79-00050 5G

Method for Depolluting Fresh and Sea Water from Petroleum Products,
W79-00058 5G

No Water-Source Damage Found in Oil States.
W79-00172 5G

Environmental Effects of Schuylkill Oil Spill II, June 1972.
W79-00294 5C

OIL RESERVOIRS
Water Analytical Data as a Tool in Drilling and Production Economics,
W79-00168 8G

OIL SPILLS
Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

Oil-Troubled Water,
W79-00169 5B

Environmental Effects of Schuylkill Oil Spill II, June 1972.
W79-00294 5C

OIL WASTES
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

OILY WASTE
New Developments in Oil Interception by Filtration,
W79-00364 5D

OILY WASTES
Factors Influencing Induced Air Flotation,
W79-00375 5D

OILY WATER
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

OKLAHOMA
Low-Flow Characteristics of Oklahoma Streams,
W79-00257 2E

High-Flow Frequencies for Selected Streams in Oklahoma,
W79-00273 2E

OLIGOTRAPHY
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

OLYMPIC PENINSULA (WASH)
Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

ON-SITE DATA COLLECTIONS
Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2G

ON-SITE INVESTIGATIONS
Aquatic Biotal Monitor,
W79-00033 5A

Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs,
W79-00074 7B

A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
W79-00116 2E

Field Investigation of Selective Withdrawal,
W79-00119 4A

Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh,
W79-00338 2L

ON-SITE LABORATORIES
Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

OPEN CHANNEL FLOW
Three-Dimensional Open Channel Flow,
W79-00312 8B

OPEN CHANNELS
Three-Dimensional Open Channel Flow,
W79-00312 8B

OPERATING COSTS
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

OPERATING RULES
Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

OPTICAL BRIGHTENERS
Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

OPTICAL PROPERTIES
The Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

Optical Classification of Natural Waters,
W79-00318 2L

OPTIMIZATION
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

Shortest Path Problems in Hydrogeology,
W79-00137 6A

The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

Dynamic Programming and the Principle of Optimality: A Systematic Approach,
W79-00396 6A

OPTIMUM DEVELOPMENT PLANS
Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price,
W79-00438 6A

ORGANIC LOADING
Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

ORGANIC MATTER
Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

ORGANIC WASTES
What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies,
W79-00179 5F

Designing and Operating an Oxygen Activate Sludge System Including Tertiary Alum-Mu Precipitation,
W79-00350 5

ORTHOPHOSPHATE
Transport Characteristics of Phosphorus i Channelized and Meandering Streams,
W79-00391 5

OUTFALL PLUMES
Simple Model for Ocean Outfall Plumes,
W79-00479 5

OUTFALL SEWERS
Simple Model for Ocean Outfall Plumes,
W79-00479 5

OVERDRAFT
Maps Showing Water-Level Declines, Lan Subsidence, and Earth Fissures in South-Ce tral Arizona,
W79-00251 7

OXIDATION
Biological Oxidation and Flotation Apparatu and Method,
W79-00030 5

Pretreatment of Industrial Wastes with Ozone
W79-00368 5

OXYGEN
Effects of Feeding and of Chemical Stimulatio on the Oxygen Uptake of Nassarius Reticulatu (Gastropoda: Prosobranchia),
W79-00083 5

Effects of Dissolved Oxygen in the Oxygen tion Activated Sludge Process,
W79-00351 5

OXYGEN CONSUMPTION (CARP)
Survival and Oxygen Consumption of Youn Kura Carp Under Various Keeping Condition (In Russian),
W79-00180 2

OXYGEN REQUIREMENTS
Adaptations and Resistance to Anoxia i Cloeon Dipterum (Ephemeroptera) and Nemou ra Cinerea (Plecoptera),
W79-00076 5

OXYGENATION
Degradation of Aqueous Phenol Solution b Gamma Irradiation,
W79-00153 5

The UNOX Process: Effective Wastewate Treatment Practice,
W79-00347 5

Comparison of Complete Mixed Activate Sludge and UNOX Treatment of Brewer Wastes,
W79-00348 5

Effects of Dissolved Oxygen in the Oxygena tion Activated Sludge Process,
W79-00351 5

Oxygen Activated Sludge Considerations fo Industrial Applications,
W79-00354 5

Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5

Aerobic Media Trickling Filter Applied t Nitrogen Control,
W79-00445 5

A Study for Improving the Aerobic-Media Trickling Filter,
W79-00457 5D

OYSTER PONDS
First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

OYSTERS
First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

OZARK NATIONAL SCENIC RIVERWAYS
Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

OZONE
Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.
W79-00306 5D

Water -- 1977.
W79-00342 5D

Pretreatment of Industrial Wastes with Ozone,
W79-00368 5D

New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection,
W79-00369 5D

A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water,
W79-00455 5G

PACIFIC NORTHWEST
The Development of the Electrical Power System in the Pacific Northwest, A Public Policy Perspective,
W79-00143 6E

Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources,
W79-00144 6E

PAPUA NEW GUINEA
Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
W79-00491 2A

PAPUA NEW GUINEA HIGHLANDS
Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
W79-00491 2A

PARAMETRIC HYDROLOGY
Stormwater Modeling,
W79-00381 5B

PARTIAL PENETRATION
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

PARTICLE SIZE
Hailstone Size inferred from Dents in Cold-Rolled Aluminum Sheet,
W79-00139 7B

PARTICLE TRAJECTORIES
Numerical Study of Continuous Saltation,
W79-00314 8B

PASTURES
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

PATENTS
Water Filtering and Dispensing Apparatus,
W79-00019 5F

Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

Ecological System and Method,
W79-00021 5G

Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Angularity Sensor Means for Center Pivot Irrigation System,
W79-00023 3F

Treatment of Effluent,
W79-00024 5D

Skimming Apparatus,
W79-00025 5G

Treatment of Lime-Sulfide Tannery Unhairing Waste,
W79-00026 5D

Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

Carbon Contact Column,
W79-00028 5D

Solid-Fluid Contacting Process,
W79-00029 5G

Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5D

Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,
W79-00031 3F

Two-Step Roll Ahead Irrigation System,
W79-00032 3F

Aquatic Biotal Monitor,
W79-00033 5A

Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping Through Soil Containing Said Water,
W79-00034 5G

Stabilization of Earth Subsurface Layers,
W79-00035 8D

Oil Fence,
W79-00036 5G

Energy Conversion System,
W79-00037 4B

Drip Irrigation System,
W79-00038 3F

Treatment of Water or Aqueous Systems,
W79-00039 5F

Belt Type Oil Removal Unit,
W79-00040 5G

Clarification Process,
W79-00041 5D

Color Removal Process,
W79-00042 5D

Battery Operated Water Purification System,
W79-00043 5F

Method for Treating Sewage,
W79-00044 5D

Water Distiller with Cone Shaped Condenser,
W79-00045 5F

Apparatus for Producing High-Purity Water,
W79-00046 5F

Remote Water Monitoring System,
W79-00047 7B

Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

Process and System for Recovery of Energy from Geothermal Brines and Other Water Containing Sources by Direct Contact with a Working Fluid Below the Critical Pressure,
W79-00049 4B

Process and Apparatus for Separating Oil From Water Contaminated with Oil,
W79-00050 5G

Automatic System Cleaner for Remote Monitor,
W79-00051 5A

Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,
W79-00052 5F

Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
W79-00053 5D

Process for the Treatment of Water Solution by Ion Exchange,
W79-00054 5F

Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

Method for Depolluting Fresh and Sea Water from Petroleum Products,
W79-00058 5G

Aboveground Sprinkling Device for Sprinkling System,
W79-00059 3F

Process for Purifying Aqueous Industrial Effluents.
W79-00399 5D

PATH OF POLLUTANTS
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

PEA
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2I

PEAK DISCHARGE
Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

PENNSYLVANIA
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

Data Base System for State Water Quality Management Information System.
W79-00222 5G

Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

PENTACHLORPHENOL
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

PERCOLATION
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

PERIPHYTON
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

PERMEABILITY
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

Allowing for the Water Permeability of Frozen Ground Screens During their Formation,
W79-00467 8D

PERSIAN GULF (IRAN)
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

PESTICIDE KINETICS
Criteria Document for DDT.
W79-00276 5A

Criteria Document for Toxaphene.
W79-00281 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples,
W79-00287 5A

PESTICIDE RESIDUES
Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations,
W79-00286 5A

PESTICIDE TOXICITY
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

Criteria Document for DDT.
W79-00276 5A

Criteria Document for Toxaphene.
W79-00281 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

PHENOLS
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

PHOSOPHO-ARGININE
The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

PHOSPHAGENS
The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

PHOSPHATES
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho,
W79-00427 5C

PHOSPHORUS
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

Total Phosphorus Transport During Storm Events,
W79-00478 5B

PHOTOGRAPHY
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

PHOTOSYNTHESIS
Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2

The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

PHOTOSYSTHESIS
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2

PHTHALATES
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

PHYTOPHILOUS FAUNA
Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

PHYTOPLANKTON
Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures,
W79-00066 5B

An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition and Nitrate Uptake,
W79-00211 5C

Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

PICK-SLOAN MISSOURI BASIN PROGRAM
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

PILOT PLANTS
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater

Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

High Temperature Elctrodialysis-Phase VI,
W79-00303 3A

Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

IPE FLOW
Shunt Meters with Segmental Orifices,
W79-00335 3F

Pipe Sizes from Modified Moody Diagram,
W79-00499 3F

IPES
Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe,
W79-00435 5B

IPING SYSTEMS
Deflection of P.V.C. Pipe Under Burial Conditions,
W79-00103 8D

LAICE
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

LANNING
Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources,
W79-00144 6E

Water Usage Requires Planning,
W79-00183 6D

Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price,
W79-00438 6A

Residential Water Conservation,
W79-00440 3D

ANT GROWTH
Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
W79-00211 5C

Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

ANT GROWTH SUBSTANCES
Water Relations of Fritted Clays,
W79-00476 2G

ANT MORPHOLOGY
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

PLANT PHYSIOLOGY
Atmospheric Water-Vapor Resources for Rainfall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.
W79-00106 10C

PLANT TRANSPIRATION
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

PLASTICS
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

PLAYAS
Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,
W79-00323 2F

PLUTONIUM
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

PODZOLIC SOILS
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

POLAND
Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

POLLUTANT IDENTIFICATION
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Aquatic Biotal Monitor,
W79-00033 5A

Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

PCB in Water, A Bibliography, Volume 3.
W79-00305 5A

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: I. Statistical Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting, (In Spanish),
W79-00385 5A

Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva),
W79-00415 5A

Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

POLLUTANTS
Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences,
W79-00419 5D

POLLUTION ABATEMENT
Oil-Troubled Water,
W79-00169 5B

On the Environmental Efficiency of Economic Systems,
W79-00230 6G

Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

POLLUTION TAXES (CHARGES)
A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

POLYCHLORINATED BIPHENYLS
A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

PCB in Water, A Bibliography, Volume 3.
W79-00305 5A

Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

POLYCHLORINATED TERPHENYLS
Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

POLYELECTROLYTES
Factors Influencing Induced Air Flotation,
W79-00375 5D

POLYMERS
Possible Use of Polymeric Materials for Fortification of Drainage Fills (In Russian),
W79-00439 4A

POLYVINYL CHLORIDE
Deflection of P.V.C. Pipe Under Burial Conditions,
W79-00103 8D

PONDS
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

PORE WATER
A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations,
W79-00325 5A

POROSITY
Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

POROUS MEDIA
A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media,
W79-00135 2F

POTABLE WATER
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe,
W79-00435 5B

POTASSIUM
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

POTATOES
Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

POTENTIOMETRIC LEVEL
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

POTOMAC RIVER BASIN
Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

POWER PLANTS
Water -- 1977.
W79-00342 5D

Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants,
W79-00358 5D

Waste Treatment for a Profit,
W79-00359 5D

Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

Case History: Ash Disposal from an Oil Fried Central Station,
W79-00361 5E

POWERPLANTS
Wet Cooling Tower Backfitting Economics,
W79-00233 5G

PRE-IMPOUNDMENT
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

PRECIPITATION ATMOSPHERIC
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

Acid Precipitation in the Netherlands,
W79-00138 5A

Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,
W79-00328 2B

Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,
W79-00339 5A

PRECIPITATION INTENSITY
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

PRESSURE
Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

PRESSURE FLUCTUATIONS
Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

PRICE RIVER (UTAH)
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

PRICES
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

Residential Water Conservation,
W79-00440 3D

PRICING
The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

PRIMARY PRODUCTIVITY
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

PRIVATE RECREATIONAL INDUSTRY
Needs of Private for Profit Enterprises in Outdoor Recreation.
W79-00097 6E

PROBABLE MAXIMUM PRECIPITATION
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

PRODUCTIVITY
Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines,
W79-00202 2I

PROJECT FEASIBILITY
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

PROJECT PLANNING
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

PROJECTS
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

PROPERTY RIGHTS
Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

PROROCENTRUM
Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

PROTECTION
Economic Impacts of Pulp and Paper Industry Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry Impact Analyses.
W79-00430 6E

PROTOZOA
The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

PSEUDOMONAS
The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

Microbial Degradation of DDT,
W79-00278 5C

Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

PUBLIC POLICY
Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

PUBLICATIONS
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District - 1977,
W79-00272 4A

PULP AND PAPER INDUSTRY
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

Water Reuse: A Trickle Becomes a Torrent,
W79-00400 3E

Looking at the Positive Side of Energy Regulation,
W79-00411 3E

The Closed Mill Concept,
W79-00420 3E

Economic Impacts of Pulp and Paper Industry Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry Impact Analyses.
W79-00430 6E

PULP WASTES
Kamloops Cleans Condensates with Steam Stillation,
W79-00162 5D

Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation,
W79-00350 5D

Sludge Treatment by Supersonic Jet-Flame,
W79-00403 5E

Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
W79-00404 5D

Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD Test,
W79-00405 5A

Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams,
W79-00407 5C

Steam Stripping Reduces Condensate at Weyco Mill,
W79-00409 3E

Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities,
W79-00412 5D

EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka),
W79-00417 5A

Clarifier With Suspended Layer of Sediment (Osvetlitel' so vzveshennym sloem osadka),
W79-00421 5D

Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode and Various measurement Methods,
W79-00429 5A

PUMPING
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

PUMPS
Well Point Systems.
W79-00182 8C

QUICKFLOW
Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

RADAR
Agricultural and Hydrological Applications of Radar: Final Report,
W79-00464 7B

RADIAL FLOWS
Air Entrainment in Radial Flow Towards Intakes,
W79-00315 8B

RADIOACTIVE WASTES
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

RADIOCHEMICAL ANALYSIS
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

RADIOISOTOPES
Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations,
W79-00227 5A

RADIOMETRY
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

RADIUM
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

RAIN
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

RAIN GAGES
Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

Electric Rainfall Intensity Sensor,
W79-00329 2B

RAIN WATER
Investigation of Rainwater for the Presence of Asbestos,
W79-00437 5A

RAINBOW TROUT
Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park,
W79-00082 5C

RAINFALL
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

Atmospheric Water-Vapor Resources for Rainfall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.
W79-00106 10C

Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,
W79-00113 2B

Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

RAINFALL

A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

Climatology of Instantaneous Rainfall Rates,
W79-00327 2B

Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,
W79-00328 2B

Electric Rainfall Intensity Sensor,
W79-00329 2B

Relationship of Rainfall and Lake Groundwater Seepage,
W79-00489 5B

RAINFALL DISPOSITION
A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

RAINFALL INTENSITY
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,
W79-00089 2B

Climatology of Instantaneous Rainfall Rates,
W79-00327 2B

Electric Rainfall Intensity Sensor,
W79-00329 2B

RAINFALL-RUNOFF RELATIONSHIP
Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

RAINFALL-RUNOFF RELATIONSHIPS
Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
W79-00491 2A

REAERATION
Laboratory Studies of Gas Tracers for Reaeration,
W79-00270 5A

RECENT EPOCH
Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00340 2C

RECLAIMED WATER
Reject Stream Replacement Study.
W79-00092 3A

RECLAMATION
Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

RECREATION
Protection of Outdoor Recreation Values of Rivers.
W79-00093 6B

Public Outdoor Recreation Benefits of Federal Water Resource Projects.
W79-00094 6E

Federal Outdoor Recreation Land Acquisition-LWCF.
W79-00095 6E

Energy Conservation and Outdoor Recreation,
W79-00096 6G

Needs of Private for Profit Enterprises in Outdoor Recreation.
W79-00097 6B

Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

RECREATION AREAS
Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data.
W79-00194 3F

RECREATION DEMAND
Needs of Private for Profit Enterprises in Outdoor Recreation.
W79-00097 6B

RECREATION FACILITIES
Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

RECREATION USAGE
Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

RECYCLING
Waste Treatment for a Profit,
W79-00359 5D

The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England,
W79-00446 5E

RED TIDE
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
W79-00210 5C

Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

REFORESTATION
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

REGIONAL ANALYSIS
Regional Geology Series: Part VII, The Colorado Plateau,
W79-00177 8B

Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

REGIONAL ELECTRIC ENERGY
Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources,
W79-00144 6E

REGIONAL FLOOD
Flood Regions in Jamaica,
W79-00330 2E

REGULATION
A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

Lake Superior Regulation Effects,
W79-00388 4C

REMOTE SENSING
Remote Water Monitoring System,
W79-00047

Automatic System Cleaner for Remote Mo
tor,
W79-00051

Applications of Remote Sensing to Hydrolo
Planning,
W79-00099

Summaries of Physical Research in
Geosciences.
W79-00101 1

Remote Monitoring of Coal Strip Mine Rel
bilitation,
W79-00226

Agricultural and Hydrological Applications
Radar: Final Report,
W79-00464

REPAYMENT CONTRACTS
Water and Land Resource Accomplishmer
1975, Statistical Appendix II-Finances a
Physical Features.
W79-00193

RESEARCH PRIORITIES
Research to Anticipate Environmental Impac
of Changing Resource Usage.
W79-00085

RESERVOIR MANAGEMENT
Operating Model for the Green River Bas
Reservoir System,
W79-00452

RESERVOIR OPERATION
Field Investigation of Selective Withdrawal,
W79-00119

Optimal Operation of Shelbyville and Carly
Lakes,
W79-00392

Operating Model for the Green River Bas
Reservoir System,
W79-00452

Control of Water Residence Time in Sma
Reservoirs,
W79-00482

RESERVOIR YIELD
Optimal Solution to the Timing, Sequencin
and Sizing of Multiple Reservoir Surface Wat
Supply Facilities When Demand Depends o
Price,
W79-00438

RESERVOIRS
Overgrowing of the Kara Kum Canal and Som
Aftereffects of Introducing the White Amu
into Water Bodies, (In Russian),
W79-00207

Control of Water Residence Time in Sma
Reservoirs,
W79-00482

Climate Change: Detection and Its Impact o
Hydrologic Design,
W79-00492

RESIDENCE TIME
Control of Water Residence Time in Smal
Reservoirs,
W79-00482

RESINS
Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

RESOURCES DEVELOPMENT
Research to Anticipate Environmental Impacts of Changing Resource Usage.
W79-00085 6G

RESPIRATION
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),
W79-00083 5C

The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

REST AREAS
Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

REVERSE OSMOSIS
Controls Drive Platers to Materials Recovery,
W79-00154 5D

Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis,
W79-00300 3A

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

EVIEWS
Frazil Ice Formation: A Review,
W79-00120 2C

Progress and Problems in the Study of Plant-Water Interrelations (In Bulgarian),
W79-00187 2I

Cattails (Typha Spp.)--Weed Problem or Potential Crop.,
W79-00198 2I

ISK ANALYSIS
Stochastic Processes in Water Resources Engineering.
W79-00380 8B

IVER BASIN DEVELOPMENT
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price,
W79-00438 6A

RIVER FLOW
Total Phosphorus Transport During Storm Events,
W79-00478 5B

RIVER PROTECTION
Protection of Outdoor Recreation Values of Rivers.
W79-00093 6B

RIVER SYSTEMS
A General Two Dimensional River Simulator,
W79-00397 2E

RIVERS
Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

Frazil Ice Formation: A Review,
W79-00120 2C

River Temperature Variation with Freezing and Storage,
W79-00477 2E

ROCKFILL DAMS
Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

RUNOFF
A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies,
W79-00115 2E

A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
W79-00116 2E

An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

Rural Water Supplies from Laterite Runoff,
W79-00387 5F

The Application of Linear Programming to Run-Off Management,
W79-00393 4A

Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

RURAL WATER QUALITY
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

RYBI POTOK (POLAND)
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

SAFETY
Safety Aspects of Toxic and Hazardous Spills,
W79-00345 5G

Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

SAINE SOILS
Correlation Between the Salt Content in the Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irrigation, (In Russian),
W79-00203 2G

SALINE WATER INTRUSION
No Water-Source Damage Found in Oil States.
W79-00172 5G

SALINITY
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions (In Russian),
W79-00180 2H

Correlation Between the Salt Content in the Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irrigation, (In Russian),
W79-00203 2G

First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

SALINITY STRUCTURE
The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
W79-00441 2L

SALT MARSHES
The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

SALTATION
Numerical Study of Continuous Saltation,
W79-00314 8B

SAMPLING
Remote Water Monitoring System,
W79-00047 7B

Automatic System Cleaner for Remote Monitor,
W79-00051 5A

Nonmetallic Electrofishing Booms and Accessory Tackle,
W79-00069 7B

Collection Bucket for Use with Tow Nets for Larval Fish,
W79-00070 7B

Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs,
W79-00074 7B

A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations,
W79-00325 5A

SAN BERNARDINO COUNTY
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

SARDINIA
The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

SATELLITES (ARTIFICIAL)
Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

SCALING
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,
W79-00052 5F

SCHEDULING
Shortest Path Problems in Hydrogeology,
W79-00137 6A

SCHUYLKILL RIVER (PENN)
Environmental Effects of Schuylkill Oil Spill II, June 1972.
W79-00294 5C

SCOUR
Scour of Bed Material in Very Rough Channels,
W79-00122 2J

SEA ICE
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

SEA WATER
Optical Classification of Natural Waters,
W79-00318 2L

On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
W79-00372 5F

SEASONAL
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

SEDIMENT
Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

SEDIMENT TRANSPORT
Measurements of Bed Load in Oscillatory Flow,
W79-00141 2J

SEDIMENTS
Mechanical Characteristics of Debris Flow,
W79-00117 2J

The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

SEEPAGE
Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping Through Soil Containing Said Water,
W79-00034 5G

Relationship of Rainfall and Lake Groundwater Seepage,
W79-00489 5B

Free-Surface Seepage Problem,
W79-00496 8D

SEEPAGE CONTROL
Seepage Control by Particle Size Selection,
W79-00484 4A

SEICHES
Hydraulics of Great Lakes Inlets,
W79-00469 8B

SEINE SURVEY
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

SELENIUM
Automated Determination of Selenium in Water,
W79-00261 5A

SELF-PURIFICATION
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

SEPARATION TECHNIQUES
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

SETTLEMENT (STRUCTURAL)
Groundwater Pumping Techniques for Excavations and Other Works,
W79-00185 8G

SEWAGE
Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

SEWAGE BACTERIA
Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water,
W79-00444 5A

SEWAGE DISPOSAL
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

Simple Model for Ocean Outfall Plumes,
W79-00479 5B

SEWAGE EFFLUENTS
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

Survival and Early Growth of Selected Trees on Waste Water Application Sites,
W79-00422 5E

A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

SEWAGE LAGOONS
Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

SEWAGE TREATMENT
Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Carbon Contact Column,
W79-00028 5D

Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5D

Method for Treating Sewage,
W79-00044 5D

Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5D

Aerobic Media Trickling Filter Applied to Nitrogen Control,
W79-00445 5D

A Study for Improving the Aerobic-Media Trickling Filter,
W79-00457 5D

SEWERS
Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanitary District of Greater Chicago, Lower Des Plaines Tunnel System.
W79-00465 5D

SHALLOW LAKE EVAPORATION
A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

SHEAR DRAG
Eddy Production Inside Wall Layers,
W79-00333 8B

SHORES
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

SHORTEST PATH
Shortest Path Problems in Hydrogeology,
W79-00137 6A

SHRIMP
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

SHUNT METERS
Shunt Meters with Segmental Orifices,
W79-00335 3F

SILICATES
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

Formation of a Vermiculite Mineral from Ground Water Components (In Russian),
W79-00382 2K

SILICON
Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,
W79-00151 5G

Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

SILICONES
UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

SILURIAN DOLOMITE
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

SIMULATION ANALYSIS
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

Simulation of Flows in Ungaged Basins,
W79-00331 2E

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Stochastic Processes in Water Resources Engineering.
W79-00380 8B

Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

A General Two Dimensional River Simulator,
W79-00397 2E

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

SIZE
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

SKANE (SWEDEN)
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

SKELETONEMA COSTATUM
Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

SLUDGE
Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

Case History: Ash Disposal from an Oil Fried Central Station,
W79-00361 5E

SLUDGE DISPOSAL
Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England,
W79-00446 5E

Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

SLUDGE TREATMENT
Water -- 1977.
W79-00342 5D

Sludge Treatment by Supersonic Jet-Flame,
W79-00403 5E

SNAILS
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),
W79-00083 5C

SNORKEL SURVEY
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

SOCIAL CHANGE
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

SOCIAL IMPACT
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

SOCIAL VALUES
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

SOCIOECONOMIC THEORY
Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

SODA BUTTE
Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

SODIUM COMPOUNDS
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

SOIL AGGREGATES
Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

SOIL COMPACTION
Control of Furrow Infiltration by Compaction,
W79-00481 3F

SOIL CONSERVATION
Soil, Water and Air Sciences Research.
W79-00105 2G

SOIL EROSION
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,
W79-00140 4C

Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

SOIL MECHANICS
Deflection of P.V.C. Pipe Under Burial Conditions,
W79-00103 8D

SOIL MOISTURE
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2G

SOIL MOISTURE

Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

SOIL PHYSICAL PROPERTIES
Deflection of P.V.C. Pipe Under Burial Conditions,
W79-00103 8D

Water and Physical Properties of the Sod-Calcareous Soils of the Crimean Foothills (In Russian),
W79-00269 2G

Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

SOIL-PLANT-WATER RELATIONSHIPS
Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

SOIL SEALANTS
Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping Through Soil Containing Said Water,
W79-00034 5G

SOIL STABILITY
Stabilization of Earth Subsurface Layers,
W79-00035 8D

SOIL TREATMENT
Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

SOIL WATER MOVEMENT
Steady Infiltration from Single and Periodic Strip Sources,
W79-00471 2G

Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications,
W79-00472 2G

SOIL-WATER-PLANT RELATIONSHIPS
Progress and Problems in the Study of Plant-Water Interrelations (In Bulgarian),
W79-00187 2I

SOILS
Irrigated Soils of the Milskaya Plain (In Russian),
W79-00060 2G

Reclamation of Meadow-Chernozem Solonetzes of the Kustanai Oblast, (In Russian),
W79-00395 2G

SOLAR ENERGY
Housing Project to Utilize Ground Water.
W79-00178 8C

SOLDIER CREEK DAM (UT)
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

SOLID WASTES
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

SOLIDS CONTACT PROCESS
Solid-Fluid Contacting Process,
W79-00029 5G

SOLONETZER
Reclamation of Meadow-Chernozem Solonetzes of the Kustanai Oblast, (In Russian),
W79-00395 2G

SOLUBILITY
The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

SOLUTES
Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications,
W79-00472 2G

SOLVENT EXTRACTION
Water -- 1977.
W79-00342 5D

Solvent Extraction for Treatment of Wastewaters from Acetic-Acid Manufacture,
W79-00366 5D

SOLVENTS
Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

SONOITA CREEK BASIN (ARIZ)
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

SORGHUM
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

SORPTION
Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

SOUTH PLATTE RIVER BASIN (COLORADO)
A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

SOUTH VIETNAM
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

SOUTHWEST NEBRASKA
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

SOVIET UNION
On the Environmental Efficiency of Economic Systems,
W79-00230 6G

SOYBEANS
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,
W79-00149 2I

SPECIES COMPOSITION
Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

SPECIES DIVERSITY
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,
W79-00277 7C

A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

SPECIES DIVERSITY INDICES
Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,
W79-00277 7C

SPECIFIC GRAVITY
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

SPECIFIC ION ELECTRODE
Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

SPILLWAYS
Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

SPOIL BANKS
Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumulations,
W79-00495 2J

SPRAY IRRIGATION
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

SPRINGS
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

SPRINKLER IRRIGATION
Aboveground Sprinkling Device for Sprinkling System,
W79-00059 3F

ST. JOHNS RIVER WATER MANAGEMENT
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

ST. LAWRENCE RIVER BASIN
Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

ST. LOUIS (MO)
Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,
W79-00328 2B

STATE GOVERNMENT
Roles/Functions of Federal, State and Local Public Agencies.
W79-00098 6E

STATISTICAL METHODS
Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: I. Statistical Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting, (In Spanish),
W79-00385 5A

STEAM
Nekoosa Cleans Condensates with Steam Distillation,
W79-00162 5D

Steam Stripping Reduces Condensate at Weyco Mill,
W79-00409 3E

How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer),
W79-00418 3E

STOCHASTIC PROCESSES
Stochastic Processes in Water Resources Engineering.
W79-00380 8B

Stormwater Modeling,
W79-00381 5B

STOMATA
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

STONEFLIES
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera),
W79-00076 5G

STORM RUNOFF
High-Flow Frequencies for Selected Streams in Oklahoma,
W79-00273 2E

Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

STORM WATER
Stormwater Modeling,
W79-00381 5B

STORMWATER
Characterization and Treatment of Stormwater Runoff,
W79-00005 5B

Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

STRAIT OF GEORGIA (CANADA)
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

STRAITS
On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System,
W79-00131 2L

Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System,
W79-00497 2L

STRATIFICATION
Field Investigation of Selective Withdrawal,
W79-00119 4A

STREAM INPUTS
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

STREAMFLOW
Low-Flow Characteristics of Oklahoma Streams,
W79-00257 2E

Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

High-Flow Frequencies for Selected Streams in Oklahoma,
W79-00273 2E

Climate Change: Detection and Its Impact on Hydrologic Design,
W79-00492 2E

STREAMFLOW FORECASTING
Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

STREAMS
Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,
W79-00277 7C

Longitudinal Dispersion of Fluid Particles in Mountain Streams: I. Theory and Field Evidence,
W79-00308 5B

Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean Motion and Its Application,
W79-00309 5B

Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

Origin and Transport of Large Boulders in Mountain Streams,
W79-00490 2J

STREPTOCOCCUS
Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water,
W79-00444 5A

STRIP MINES
Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

STRIP MINING
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

SUBMERGED JUMP
Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

SUBMERGENCE
Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

SUBSIDIES
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

SUBSURFACE FLOW
Stabilization of Earth Subsurface Layers,
W79-00035 8D

SUBSURFACE RUNOFF
A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies,
W79-00115 2E

A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
W79-00116 2E

SUCCESSION
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

SUGAR INDUSTRY
Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

SUGARBEETS
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters,
W79-00296 3F

SULFATES
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode and Various measurement Methods,
W79-00429 5A

SULFITE LIQUORS
Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva),
W79-00415 5A

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka),
W79-00417 5A

SULFITE PULP MILLS
Development of an Effluent-Free Sulfite Pulp Mill (Entwicklung zur abwasserfrei arbeitenden Sulfitzellstoff-fabrik),
W79-00424 5D

SULFUR
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2I

Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,
W79-00339 5A

SULFUR BACTERIA
Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

SUPPLEMENTAL IRRIGATION
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

SURFACE-GROUNDWATER RELATIONSHIPS
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

SURFACE RUNOFF
A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies,
W79-00115 2E

A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
W79-00116 2E

SURFACE WATER
Water Resources Data for Wisconsin, Water Year 1977.
W79-00267 7C

SURFACE WATERS
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

SURVEYING INSTRUMENTS
Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

SURVEYS
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

The Demand for Clean Water: The Case of the Charles River,
W79-00234 6B

Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,
W79-00321 5A

SUSPENDED SOLIDS
Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,
W79-00352 5D

EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

Control of Water Residence Time in Small Reservoirs,
W79-00482 4A

SUSQUEHANNA RIVER BASIN
Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

SWAB MATERIALS
B. R. /Hanson ;I. A. /Schipper
W79-00150 5C

SWEDEN
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

Wet Meadows in Southern Sweden: Vegetation, Succession and Management (In Swedish),
W79-00288 2I

SWIMMING
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

SYNTHESIS
Continuous Electrochemical Synthesis Using a Packed Granular Electrode,
W79-00432 5D

SYNTHETIC RUBBER
Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

SYSTEMS ANALYSIS
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

Conjunctive Use of Ground and Surface Water,
W79-00170 4B

TANNERY WASTES
The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

TEMPERATURE
First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00295 2L

TENNESSEE
Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

TENNESSEE VALLEY
Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

TENNESSEE VALLEY AUTHORITY
Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

TERATOGENS
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins,
W79-00283 5A

TERTIARY TREATMENT
Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

TESTING PROCEDURES
Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD Test,
W79-00405 5A

TEXTILES
Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena

toksycznosci ostrej wybranych srodkow pomocniczych),
W79-00413 5C

HE NETHERLANDS
Acid Precipitation in the Netherlands,
W79-00138 5A

A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

HEORETICAL ANALYSIS
Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

Steady Infiltration from Single and Periodic Strip Sources,
W79-00471 2G

Internal Fronts in Two-Layer Flo,
W79-00486 8H

HERMAL CONDUCTIVITY
Energy Conversion System,
W79-00037 4B

HERMAL POLLUTION
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,
W79-00068 5C

HERMAL WATER
Digging for New Sources of Energy.
W79-00175 8B

HERMOMECHANICAL PULPING
How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer),
W79-00418 3E

IDAL EFFECTS
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

IDAL MARSHES
Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh,
W79-00338 2L

IN
Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

ISSUE ANALYSIS
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

Criteria Document for DDT.
W79-00276 5A

Criteria Document for Toxaphene.
W79-00281 5A

Criteria Documents for Aldrin/Dieldrin.
W79-00282 5A

Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples,
W79-00287 5A

Multimedia Levels--Mercury,
W79-00291 5B

TISSUE BIOASSAY
Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

A Comparative In Vitro Study of the Effects of Various Balanced Saline Solutions on Respiration Rates of Liver Tissues of Three Fish Species,
W79-00454 5C

TOCCOA FALLS DAM
Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

TOXAPHENE
Criteria Document for Toxaphene.
W79-00281 5A

TOXICITY
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

The Biological Effects of Toxic Material Spills,
W79-00344 5C

Safety Aspects of Toxic and Hazardous Spills,
W79-00345 5G

Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych),
W79-00413 5C

TOXICITY TESTING
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

TOXINS
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

TRACE ELEMENTS
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

Automated Determination of Selenium in Water,
W79-00261 5A

Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00271 5B

TRACE METALS
Effects of Municipal Sewage Effluent Irrigation on the Trace Metal Content of Earthworms,
W79-00009 5C

TRACERS
A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies,
W79-00115 2E

Laboratory Studies of Gas Tracers for Reaeration,
W79-00270 5A

Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

Chlorofluorocarbons as Hydrologic Tracers A New Technology,
W79-00461 5A

TRANSPIRATION
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

TRAWLING
Nonmetallic Electrofishing Booms and Accessory Tackle,
W79-00069 7B

TREATMENT FACILITIES
Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota,
W79-00102 5D

Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

Cost Estimates for Construction of Publicly-Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00248 5G

TREES
Survival and Early Growth of Selected Trees on Waste Water Application Sites,
W79-00422 5E

TRICKLING FILTERS
Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5D

Aerobic Media Trickling Filter Applied to Nitrogen Control,
W79-00445 5D

A Study for Improving the Aerobic-Media Trickling Filter,
W79-00457 5D

TROPHIC LEVEL
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

TROPHIC STATE MODELS
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate,
W79-00001 5C

TROPICAL REGIONS
Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,
W79-00113 2B

A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

TUNNELS
Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanitary District of Greater Chicago, Lower Des Plaines Tunnel System.
W79-00465 5D

TYPE CURVES
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

ULTRAFILTRATION
Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences,
W79-00419 5D

ULTRAVIOLET RADIATION
New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection,
W79-00369 5D

UNDEPLETABLE EXTERNALITIES
The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

UNGAGED BASINS
Simulation of Flows in Ungaged Basins,
W79-00331 2E

UNITED KINGDOM
Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

UNITED STATES
On the Environmental Efficiency of Economic Systems,
W79-00230 6G

Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience,
W79-00232 6G

River Temperature Variation with Freezing and Storage,
W79-00477 2E

Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,
W79-00488 2L

UNOX
The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

UNSTEADY FLOW
Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

A General Two Dimensional River Simulator,
W79-00397 2E

UPPER SNAKE RIVER BASIN (IDA)
The Source of American Falls Reservoir Pollutants,
W79-00004 5B

URBAN DRAINAGE
Characterization and Treatment of Stormwater Runoff,
W79-00005 5B

URBAN RUNOFF
Characterization and Treatment of Stormwater Runoff,
W79-00005 5B

Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

URBAN SOCIOLOGY
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

URBAN WATERSHEDS
Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

UTAH
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

The Historic Level of Great Salt Lake, Utah,
W79-00264 2H

UTILIZATION
Cattails (Typha Spp.)--Weed Problem or Potential Crop.,
W79-00198 2I

VALUE
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

VANADIUM
Waste Treatment for a Profit,
W79-00359 5D

VAPOR COMPRESSION DISTILLATION
Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater,
W79-00015 3A

VARIABILITY
Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,
W79-00113 2B

VEGETATION
Vegetation of Southeastern Florida -- Parts II - V,
W79-00196 2I

The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines,
W79-00202 2I

Wet Meadows in Southern Sweden: Vegetation, Succession and Management (In Swedish),
W79-00288 2I

VEGETATION STABILIZATION
Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

VERMICULITE
Formation of a Vermiculite Mineral from Ground Water Components (In Russian),
W79-00382 2K

VIRAL RECOVERY RATES
B. R. /Hanson ;I. A. /Schipper
W79-00150 5C

VIRGINIA
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

VIRUSES
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

B. R. /Hanson ;I. A. /Schipper
W79-00150 5C

Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

VISCOUS FLOW
Eddy Production Inside Wall Layers,
W79-00333 8B

VOLUME
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

VORTICES
Eddy Production Inside Wall Layers,
W79-00333 8B

WAKE TRAILS
Eddy Production Inside Wall Layers,
W79-00333 8B

WALES
An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

WASHINGTON
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River Canyon, Washington,
W79-00146 6G

Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

WASOPT METHODOLOGY
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

WASTE DILUTION
Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,
W79-00151 5G

Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

WASTE DISPOSAL
Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

WASTE TREATMENT
Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

Waste Treatment for a Profit,
W79-00359 5D

Case History: Ash Disposal from an Oil Fried Central Station,
W79-00361 5E

Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

WASTE WATER
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

WASTE WATER IRRIGATION
Effects of Municipal Sewage Effluent Irrigation on the Trace Metal Content of Earthworms,
W79-00009 5C

WASTE WATER PURIFICATION
Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

WASTE WATER TREATMENT
Characterization and Treatment of Stormwater Runoff,
W79-00005 5B

Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Treatment of Effluent,
W79-00024 5D

Treatment of Lime-Sulfide Tannery Unhairing Waste,
W79-00026 5D

Carbon Contact Column,
W79-00028 5D

Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5D

Clarification Process,
W79-00041 5D

Color Removal Process,
W79-00042 5D

Method for Treating Sewage,
W79-00044 5D

Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
W79-00053 5D

Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota,
W79-00102 5D

Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

Cost Estimates for Construction of Publicly-Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00248 5G

Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.
W79-00306 5D

Water -- 1977.
W79-00342 5D

The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation,
W79-00350 5D

Effects of Dissolved Oxygen in the Oxygenation Activated Sludge Process,
W79-00351 5D

Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,
W79-00352 5D

Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants,
W79-00358 5D

Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

New Developments in Oil Interception by Filtration,
W79-00364 5D

pH Control Systems Using Carbon Dioxide,
W79-00365 5D

Solvent Extraction for Treatment of Wastewaters from Acetic-Acid Manufacture,
W79-00366 5D

Pretreatment of Industrial Wastes with Ozone,
W79-00368 5D

New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection,
W79-00369 5D

Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

Factors Influencing Induced Air Flotation,
W79-00375 5D

Critical Analysis of Flotation Performance,
W79-00376 5D

Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

Process for Purifying Aqueous Industrial Effluents.
W79-00399 5D

Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

Steam Stripping Reduces Condensate at Weyco Mill,
W79-00409 3E

On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle),
W79-00410 5D

Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities,
W79-00412 5D

EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

Clarifier With Suspended Layer of Sediment (Osvetlitel' so vzveshennym sloem osadka),
W79-00421 5D

Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter,
W79-00433 5D

Aerobic Media Trickling Filter Applied to Nitrogen Control,
W79-00445 5D

A Study for Improving the Aerobic-Media Trickling Filter,
W79-00457 5D

WATER ANALYSIS

Water Analytical Data as a Tool in Drilling and Production Economics,
W79-00168 8G

Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

Automated Determination of Selenium in Water,
W79-00261 5A

Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode and Various measurement Methods,
W79-00429 5A

WATER AUTHORITIES

Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

WATER BALANCE

A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

WATER CHEMISTRY

Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

Water Analytical Data as a Tool in Drilling and Production Economics,
W79-00168 8G

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,
W79-00321 5A

Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

Total Phosphorus Transport During Storm Events,
W79-00478 5B

WATER CIRCULATION

Generation and Propagation of Downwelling Fronts,
W79-00128 2H

Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,
W79-00488 2L

WATER CONSERVATION

Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

Soil, Water and Air Sciences Research.
W79-00105 2G

How Kind to the Resources is the Grinding Process. (Hvor ressursvennlig er slipeprosessen),
W79-00408 3E

The Closed Mill Concept,
W79-00420 3E

Residential Water Conservation,
W79-00440 3D

WATER DEMAND

Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

WATER DISTRIBUTION

Water and Land Resource Accomplishments 1975, Statistical Appendix I.
W79-00192 3F

WATER/ENERGY DEMAND

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

WATER/ENERGY POLICY

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

WATER/ENERGY SYSTEM

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

WATER HARVESTING

Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

WATER HYACINTH

Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

WATER LEVEL FLUCTUATIONS

Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

The Historic Level of Great Salt Lake, Utah,
W79-00264 2H

WATER LEVELS

Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

WATER MANAGEMENT

Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

WATER MANAGEMENT (APPLIED)

Conjunctive Use of Ground and Surface Water,
W79-00170 4B

Water Usage Requires Planning,
W79-00183 6D

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

Management Aspects of Cyclic Storage of Water in Aquifer Systems,
W79-00386 4B

WATER POLICY

Public Outdoor Recreation Benefits of Federal Water Resource Projects.
W79-00094 6E

Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

The National Water Commission Revisited Perspective on National Water Policy Studies, with some Implications for Changes in Future Water Policy,
W79-00383 6E

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

WATER POLLUTION

Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

Pollution of Groundwater Through Nonlinear Diffusion,
W79-00110 5B

Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

Water -- 1977.
W79-00342 5D

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

Stormwater Modeling,
W79-00381 5B

A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

WATER POLLUTION CONTROL

Skimming Apparatus,
W79-00025 5G

Belt Type Oil Removal Unit,
W79-00040 5G

Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

Method for Depolluting Fresh and Sea Water from Petroleum Products,
W79-00058 5G

No Water-Source Damage Found in Oil States.
W79-00172 5G

What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies,
W79-00179 5F

A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

Development of an Effluent-Free Sulfite Pulp Mill (Entwicklung zur abwasserfrei arbeitenden Sulfitzellstoff-fabrik),
W79-00424 5D

WATER POLLUTION EFFECT

The Biological Effects of Toxic Material Spills,
W79-00344 5C

WATER POLLUTION EFFECTS

Aquatic Biotal Monitor,
W79-00033 5A

Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh,
W79-00206 5C

Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage,
W79-00220 5C

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

Safety Aspects of Toxic and Hazardous Spills,
W79-00345 5G

Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
W79-00404 5D

Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams,
W79-00407 5C

Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych),
W79-00413 5C

Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho,
W79-00427 5C

WATER POLLUTION SOURCES

The Source of American Falls Reservoir Pollutants,
W79-00004 5B

Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

WATER POLLUTION TREATMENT

Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

Treatment of Effluent,
W79-00024 5D

Skimming Apparatus,
W79-00025 5G

Treatment of Lime-Sulfide Tannery Unhairing Waste,
W79-00026 5D

WATER POLLUTION TREATMENT

Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5D

Oil Fence,
W79-00036 5G

Belt Type Oil Removal Unit,
W79-00040 5G

Clarification Process,
W79-00041 5D

Process and Apparatus for Separating Oil From Water Contaminated with Oil,
W79-00050 5G

Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

WATER PROPERTIES

Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

WATER PURIFICATION

Water Filtering and Dispensing Apparatus,
W79-00019 5F

Battery Operated Water Purification System,
W79-00043 5F

Water Distiller with Cone Shaped Condenser,
W79-00045 5F

Apparatus for Producing High-Purity Water,
W79-00046 5F

Process for the Treatment of Water Solution by Ion Exchange,
W79-00054 5F

Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

WATER PURIFICATION DOSING APPARATUS

Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

WATER QUALITY

Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

Environmental Management Strategy for the Great Lakes System.
W79-00084 5G

Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

Water Hardness and Cardiovascular Mortality,
W79-00171 5C

Data Base System for State Water Quality Management Information System.
W79-00222 5G

Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

Groundwater Quality Atlas of Nebraska,
W79-00252 7C

Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

Water Resources Data for Pennsylvania, Water Year 1977--Volume 2. Susquehanna and Potomac River Basins.
W79-00265 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 1. Delaware River Basin.
W79-00266 7C

Water Resources Data for Wisconsin, Water Year 1977.
W79-00267 7C

Water Resources Data for Pennsylvania, Water Year 1977--Volume 3. Ohio River and St. Lawrence River Basins.
W79-00268 7C

Modelling the Water Quality of the Hydrological Cycle.
W79-00379 5B

Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

WATER QUALITY CONTROL

Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

Water Filtering and Dispensing Apparatus,
W79-00019 5F

Ecological System and Method,
W79-00021 5G

Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

Solid-Fluid Contacting Process,
W79-00029 5G

Oil Fence,
W79-00036 5G

Automatic System Cleaner for Remote Monitor,
W79-00051 5A

Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

Data Base System for State Water Quality Management Information System.
W79-00222 5G

The Demand for Clean Water: The Case of the Charles River,
W79-00234 6B

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

WATER QUALITY INDICES

Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,
W79-00219 5C

WATER QUALITY STANDARDS

A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

WATER RESOURCES

A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

Public Outdoor Recreation Benefits of Federal Water Resource Projects.
W79-00094 6E

Soil, Water and Air Sciences Research.
W79-00105 2G

Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

Data Base System for State Water Quality Management Information System.
W79-00222 5G

Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

Lake Level Control and Management--A Case Study,
W79-00390 4A

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
W79-00442 8A

WATER RESOURCES DEVELOPMENT
Public Outdoor Recreation Benefits of Federal Water Resource Projects.
W79-00094 6E

Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price,
W79-00438 6A

WATER REUSE
Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

Reject Stream Replacement Study.
W79-00092 3A

Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

Water Reuse: A Trickle Becomes a Torrent,
W79-00400 3E

The Closed Mill Concept,
W79-00420 3E

WATER SAMPLING
Simple Sampler Activation and Recording System,
W79-00480 7B

WATER SOFTENING
Process for the Treatment of Water Solution by Ion Exchange,
W79-00054 5F

WATER SOURCES
Water Analytical Data as a Tool in Drilling and Production Economics,
W79-00168 8G

WATER STORAGE
Management Aspects of Cyclic Storage of Water in Aquifer Systems,
W79-00386 4B

WATER SUPPLY
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

Rural Water Supplies from Laterite Runoff,
W79-00387 5F

Residential Water Conservation,
W79-00440 3D

Resource Analysis: Water and Energy as Linked Resources,
W79-00453 6D

WATER SUPPLY DEVELOPMENT
New Approach Gets Results in Utah Well,
W79-00181 8B

WATER TABLE
A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

WATER TEMPERATURE
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera),
W79-00076 5G

Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

River Temperature Variation with Freezing and Storage,
W79-00477 2E

WATER TREATMENT
Water Filtering and Dispensing Apparatus,
W79-00019 5F

Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

Solid-Fluid Contacting Process,
W79-00029 5G

Treatment of Water or Aqueous Systems,
W79-00039 5F

Battery Operated Water Purification System,
W79-00043 5F

Water Distiller with Cone Shaped Condenser,
W79-00045 5F

Apparatus for Producing High-Purity Water,
W79-00046 5F

Automatic System Cleaner for Remote Monitor,
W79-00051 5A

Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,
W79-00052 5F

Process for the Treatment of Water Solution by Ion Exchange,
W79-00054 5F

Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

Water Treatment: Iron, Boiler Water and Water Analysis.
W79-00176 5F

What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies,
W79-00179 5F

Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.
W79-00306 5D

Rural Water Supplies from Laterite Runoff,
W79-00387 5F

Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite,
W79-00431 5D

Continuous Electrochemical Synthesis Using a Packed Granular Electrode,
W79-00432 5D

WATER USE FUNCTIONS
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

WATER UTILIZATION
Point Source Analysis. Inventory, Water Demands, and Problem Area Identification. (Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500.
W79-00104 6D

Water Usage Requires Planning,
W79-00183 6D

WATER VAPOR
Atmospheric Water-Vapor Resources for Rainfall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.
W79-00106 10C

WATER WELLS
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

Regional Geology Series: Part VII, The Colorado Plateau,
W79-00177 8B

New Approach Gets Results in Utah Well,
W79-00181 8B

Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

WATER YIELD
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

WATERSHED MANAGEMENT
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

The Application of Linear Programming to Run-Off Management,
W79-00393 4A

Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

WATERSHED MODEL
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

WATERSHEDS (BASINS)
Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

WEATHER FORECASTING
Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

WEATHER MODIFICATION
Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

WELFARE (ECONOMICS)
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,
W79-00231 6B

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
W79-00240 6E

WELL DESIGN
Water Well Development Decisions,
W79-00167 8B

WELL DEVELOPMENT
Water Well Development Decisions,
W79-00167 8B

WELL POINTS
Well Point Systems.
W79-00182 8C

WELL SCREENS
Water Well Development Decisions,
W79-00167 8B

Efficiency of Screenless Wells for Irrigation,
W79-00184 3F

WELLINGTON RESERVOIR (WESTERN AUSTRALIA)
Field Investigation of Selective Withdrawal,
W79-00119 4A

WELLS
Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00111 2F

Efficiency of Screenless Wells for Irrigation,
W79-00184 3F

Functions and Properties of Drilling Mud.
W79-00186 8G

WEST INDIES
Flood Regions in Jamaica,
W79-00330 2E

WESTERN AUSTRALIA
Field Investigation of Selective Withdrawal,
W79-00119 4A

WESTERN UNITED STATES
Water and Land Resource Accomplishments 1975. Summary Report.
W79-00191 3F

WET SEASONS
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

WETLANDS
Summary of Study Findings, Phase I Report: Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands,
W79-00195 4C

Wetlands as a Naval Environmental Concern,
W79-00201 6G

WHEAT
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2I

WHEY
Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

WHITE AMUR
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
W79-00207 4A

WILD BROOK TROUT
Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

WILD RICE
Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

WILD RIVER ACT
Protection of Outdoor Recreation Values of Rivers.
W79-00093 6B

WILD RIVERS
Protection of Outdoor Recreation Values of Rivers.
W79-00093 6B

Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

WILDLIFE
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

WILLINGNESS TO PAY
The Demand for Clean Water: The Case of the Charles River,
W79-00234 6B

WINDS
Generation and Propagation of Downwelling Fronts,
W79-00128 2H

WISCHMEIER-SMITH EQUATION
Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

WISCONSIN
Water Resources Data for Wisconsin, Water Year 1977.
W79-00267 7C

WOOD WASTES
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

WYOMING
Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

YELLOWSTONE NATIONAL PARK
Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

YELLOWSTONE RIVER
Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969.
W79-00250 5A

ZIMOWY WIELKI POND (POLAND)
Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

ZIZANIA AQUATICA VAR. AQUATICA
Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

ZOOPLANKTON
Nonmetallic Electrofishing Booms and Accessory Tackle,
W79-00069 7B

AUTHOR INDEX

ACKERSON, R. C.
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

ADAMS, C. E. JR.
Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

ALDRICH, A.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

ALEKSEEVA, T. L.
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

ALEXANDER, C. L.
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

ALEXANDER, M.
Microbial Degradation of DDT,
W79-00278 5C

ANDERSON, C. L.
Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,
W79-00341 8B

ANDERSON, H. R.
Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,
W79-00255 7C

ANDERSON, J. E.
Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

ANDERSON, K. B.
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species,
W79-00443 5C

ANDERSON, L. G.
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
W79-00235 6E

ARIAS, E.
The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

ARMBRUSTER, J. T.
Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00263 2E

ARMSTRONG, D. A.
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

ARMSTRONG, J. M.
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

ARNOW, T.
The Historic Level of Great Salt Lake, Utah,
W79-00264 2H

ASHBY, J.
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

ASHBY, W. C.
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

ASKEROV, T. A.
Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions (In Russian),
W79-00180 2H

ASKETH, P.
Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

AUSTIN, D. F.
Vegetation of Southeastern Florida -- Parts II - V,
W79-00196 2I

BABAEV, M. P.
Irrigated Soils of the Milskaya Plain (In Russian),
W79-00060 2G

BACA, R. G.
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

BAKER, K. S.
Optical Classification of Natural Waters,
W79-00318 2L

BALEK, J.
A Storm Rainfal Pattern Above the Central African Plateau,
W79-00126 2B

BARKER, J. C.
Simple Sampler Activation and Recording System,
W79-00480 7B

BARKO, J. W.
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 5C

BARKS, J. H.
Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00254 5B

BARR, L. R.
Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

BARRETT, J. H.
Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

BARTON, C. A.
EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

BASAK, P.
Pollution of Groundwater Through Nonlinear Diffusion,
W79-00110 5B

BASKETT, R. C.
A Method of Measuring Bacterial Growth in Aquatic Environments Using Dialysis Culture,
W79-00109 5A

BATEMAN, S. T.
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

BATTALINO, T. E.
Electric Rainfall Intensity Sensor,
W79-00329 2B

BATU, V.
Steady Infiltration from Single and Periodic Strip Sources,
W79-00471 2G

BAYAZIT, M.
Scour of Bed Material in Very Rough Channels,
W79-00122 2J

BEALE, J. H.
Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis,
W79-00300 3A

BECK, G. J.
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

BELL, B. A.
Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5D

BEN-ASHER, J.
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

BENNETT, J. E.
On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
W79-00372 5F

BERGER, H. F.
Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD Test,
W79-00405 5A

BERKS, R.
Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
W79-00208 5C

BERRY, R. S.
Resource Analysis: Water and Energy as Linked Resources,
W79-00453 6D

BERRYHILL, D. L.
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

BEVER, T. D.
Energy Conservation and Outdoor Recreation,
W79-00096 6G

BIRMINGHAM, A.
Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources,
W79-00144 6E

BISKNER, C. D.
EPA's Goal for Suspended Solids is Not Met with Media Filtration,
W79-00414 5D

BISZ-KONARZEWSKA, A.
The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

BLAIR, S. H.
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

BLANCHARD, D. C.
Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

BLEDSOE, D. R.
Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

BLEEK, J. M.
Rainfall Frequencies for the Persian Gulf Coast of Iran,
W79-00123 2B

BLINN, D. W.
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

BLIVEN, L.
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

BLOCK, C. S.
Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

BLOCK, J.
Development of Low Cost Membrane Cleaning Agents,
W79-00304 3A

BOERSMA, L.
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

BOGOMOLOV, Y.
Efficiency of Screenless Wells for Irrigation,
W79-00184 3F

BOLTE, W. B.
Water Distiller with Cone Shaped Condenser,
W79-00045 5F

BOMBOWNA, M.
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Content in Attached Algae and Seston in Relation to the Pollution,
W79-00218 5C

BONNICKSEN, T. M.
Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

BOOKER, R. E.
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

BOONE, R. D.
Two-Step Roll Ahead Irrigation System,
W79-00032 3F

BOOTH, G. M.
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

BORNE, B. J.
Textile Waste Waters: Treatment and Environmental Effects,
W79-00166 3E

BORSETTI, A. P.
Identification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

BORTON, D. L.
A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams,
W79-00407 5C

BOSCAK, V. G.
Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

BOSE, R. N.
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra,
W79-00107 4B

BOWLES, D. S.
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

BRADFORD, J. D.
Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
W79-00090 2C

BRANDSTETTER, A.
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

BREITENBECK, G. A.
Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

BREITNER, N. F.
Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
W79-00229 5C

BRENMAN, J. E.
Treatment of Liquid Wastes from Fossil Fuel Power Plants,
W79-00355 5D

BRENNIMAN, G. R.
Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

BROMLEY, D. W.
Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery,
W79-00236 6E

Property Rules, Liability Rules, and Environmental Economics,
W79-00241 6E

BROOKMAN, G. T.
Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

BROWN, R. S.
Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

BRTKO, W. J.
Transfer of Gases at Natural Air-Water Interfaces,
W79-00127 2L

BRUCH, J. C. JR.
Free-Surface Seepage Problem,
W79-00496 8D

BRUNSDON, G. P.
Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

BUCHANAN, D. U.
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

BUGAKOVA, A. N.
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2I

UMP, R. L.
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

UONO, A.
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

URGES, S. J.
Climate Change: Detection and Its Impact on Hydrologic Design,
W79-00492 2E

Conjunctive Use of Ground and Surface Water,
W79-00170 4B

URGESS, T.
Nekoosa Cleans Condensates with Steam Distillation,
W79-00162 5D

URKHARDT, C. W.
Factors Influencing Induced Air Flotation,
W79-00375 5D

URROWS, J.
Treatment of Water or Aqueous Systems,
W79-00039 5F

URRUSS, R. P. JR.
Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

URTON, R. A.
UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

URTON, R. E.
Ecological System and Method,
W79-00021 5G

USH, S. W.
The Closed Mill Concept,
W79-00420 3E

USS, I. O.
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River Canyon, Washington,
W79-00146 6G

AGNATI, V. N.
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

AHN, R. P.
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

AIN, G.
Stabilization of Earth Subsurface Layers,
W79-00035 8D

ALDWELL, R. S.
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister,
W79-00065 5C

ALF, G. E.
The Isotope Hydrology of the Mereenie Sandstone Aquifer, Alice Springs, Northern Territory, Australia,
W79-00322 2F

CAPODANNO, G.
The Toxicity of Manganese Ethylenebisdithiocarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

CARON, A. L.
Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

CARPENTER, V.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

CARPENTER, W. L.
Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD Test,
W79-00405 5A

CARR, J. C.
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

CARTEE, C. P.
A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

CARTWRIGHT, K.
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

CASCIANO, R. M.
pH Control Systems Using Carbon Dioxide,
W79-00365 5D

CASHMAN, P. M.
Groundwater Pumping Techniques for Excavations and Other Works,
W79-00185 8G

CASTRUCCIO, P.
Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

CAUSSEAUX, K. W.
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977,
W79-00272 4A

CEARLOCK, D. B.
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

CHADWICK, D. G.
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

CHAN, P.
Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

CHANDRASHEKAR, M.
A General Two Dimensional River Simulator,
W79-00397 2E

CHAPPELL, C. F.
Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

CHARNELL, R. L.
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

CHAUDHURI, H.
Control of Aquatic Weed by Moth Larvae,
W79-00197 4A

CHEN, E. H.
Determination of Chrysotile Asbestos in Rainwater,
W79-00014 5A

Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water,
W79-00013 5A

CHEN, M. S.
Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

CHEREMISINOFF, P. N.
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

CHET, I.
Studies in Microbial Chemotactic Behavior in Seawater,
W79-00293 5C

CHIU, C. L.
Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

Three-Dimensional Open Channel Flow,
W79-00312 8B

CHOI, P. M. K.
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

CHU, T-Y.
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

CHURSCHILL, R. J.
Critical Analysis of Flotation Performance,
W79-00376 5D

CLEM, A. G.
Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping Through Soil Containing Said Water,
W79-00034 5G

CLEMENS, D. H.
Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

CLYDE, G.
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

COCHRAN, C. L.
Wetlands as a Naval Environmental Concern,
W79-00201 6G

COHEN, A. L.
Belt Type Oil Removal Unit.
W79-00040 5G

COKER, R. D.
Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin.
W79-00339 5A

COLE, C. R.
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A.
W79-00188 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C.
W79-00190 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B.
W79-00189 5B

A Water Quality Model for the South Platte River Basin, Documentation Report.
W79-00398 5B

COLEMAN-MAROIS, K.
Vegetation of Southeastern Florida -- Parts II - V.
W79-00196 2I

COLEMAN, W. D.
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation.
W79-00370 5D

COLTHARP, G. B.
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed.
W79-00448 5B

CONEWAY, C. R.
Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant.
W79-00352 5D

CONKLIN, P. J.
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle.
W79-00078 5C

CONTRACTOR, D. N.
A Model for Evaluating the Effect of Land Uses on Flood Flows.
W79-00450 4C

COOK, P. M.
Asbestos - A Bibliography.
W79-00225 5A

COOLEY, J. H.
Survival and Early Growth of Selected Trees on Waste Water Application Sites.
W79-00422 5E

COPLAN, M. J.
Laboratory Studies on Advanced Composite H I Modules for Seawater Reverse Osmosis.
W79-00300 3A

COSTA, H.
A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams.
W79-00407 5C

COTHRON, P. D.
A Comparative In Vitro Study of the Effects of Various Balanced Saline Solutions on Respiration Rates of Liver Tissues of Three Fish Species.
W79-00454 5C

COULTAS, C. L.
Vegetative Stabilization of Dredge Spoil in North Florida.
W79-00337 5G

CREMEANS, J. E.
Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Experience.
W79-00232 6G

CREWS, R. C.
Species Diversity Indices of the Fish Populations of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida.
W79-00277 7C

CRISP, M.
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia).
W79-00083 5C

CROLEY, T. E. II
Wet Cooling Tower Backfitting Economics.
W79-00233 5G

CRONIN, E. A.
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah.
W79-00297 2H

CURRIE, P. O.
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type.
W79-00140 4C

CZARNECKI, D. B.
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity.
W79-00285 5A

D'ANTONI, J. M.
Effects of Dissolved Oxygen in the Oxygenation Activated Sludge Process.
W79-00351 5D

DADDIO, E.
Inertial Currents Over the Inner Shelf Near 30 Degree N.
W79-00133 2L

DALE, R. F.
A Soil Moisture Budget Model Accounting for Shallow Water Table Influences.
W79-00473 2G

DALRYMPLE, R. W.
Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada.
W79-00336 2L

DANZBERGER, A. H.
New Developments in Oil Intereception by Filtration.
W79-00364 5D

DAVENPORT, J.
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia).
W79-00083 5C

DAVIS, C. O.
Continuous Culture of Marine Diatoms Und
Silicon Limitation. 3. A Model of Si-Limit
Diatom Growth.
W79-00229

DAVIS, J. C.
Water Reuse: A Trickle Becomes a Torrent.
W79-00400

DAVIS, M. A.
The Photosynthetic and Respiratory Rates a
Tolerances of Benthic Algae from a Mangro
and Salt Marsh Estuary: A Comparative Stud
W79-00204

DAVIS, P. B.
Summary of Study Findings, Phase I Repo
Ecological Effects of Highway Constructi
Upon Michigan Woodlots and Wetlands.
W79-00195

DAVIS, R. B.
Laboratory Studies on Advanced Composite
F Modules for Seawater Reverse Osmosis.
W79-00300

DAVIS, S. N.
Tracing Sewage Effluent Recharge - Tucso
Arizona.
W79-00299

DAWES, C. J.
The Photosynthetic and Respiratory Rates a
Tolerances of Benthic Algae from a Mangro
and Salt Marsh Estuary: A Comparative Stud
W79-00204

DAY, T. J.
Longitudinal Dispersion of Fluid Particles
Mountain Streams: I. Theory and Fie
Evidence.
W79-00308

Longitudinal Dispersion of Fluid Particles
Mountain Streams: 2. Similarity of the Mea
Motion and Its Application.
W79-00309

DE BRUIN, H. A. R.
A Simple Model for Shallow Lake Evapor
tion.
W79-00326

DE LA CRUZ, A. A.
Changes in Interstitial Water Salinity of a Mi
sissippi Tidal Marsh.
W79-00338

DEBLER, W.
Pipe Sizes from Modified Moody Diagram.
W79-00499

DECARLO, V. J.
Multimedia Levels--Mercury.
W79-00291

DEGEN, L.
Method for Depolluting Fresh and Sea Wate
from Petroleum Products.
W79-00058

DELHOMME, J. P.
Kriging in the Hydrosciences.
W79-00134

DENDY, F. E.
Control of Water Residence Time in Smal
Reservoirs.
W79-00482

ENNIS, R. E.
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters.
W79-00296 3F

EUTSCHER, R. L.
Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia.
W79-00323 2F

EVOL, A. H.
Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton.
W79-00212 5C

JESO, A.
The Phosphagens of Some Protozoa as Ecological Indicators (In French).
W79-00423 5A

JESO, F.
The Phosphagens of Some Protozoa as Ecological Indicators (In French).
W79-00423 5A

NUNZIO, J. E.
Evaluation of Donnan Dialysis for the Enrichment of Cations.
W79-00434 5A

ODD, F. P.
Energy Conservation and Outdoor Recreation.
W79-00096 6G

ONIGIAN, A. S. JR.
Continuous Simulation of Nonpoint Pollution.
W79-00493 5B

OUBLE, M. L.
Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water.
W79-00444 5A

OWNING, D. J.
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California.
W79-00253 7C

OWNING, J. A.
Relationship of Rainfall and Lake Groundwater Seepage.
W79-00489 5B

RORI, M.
Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation.
W79-00031 3F

UDZIK, B. E.
Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants.
W79-00358 5D

UFFY, R. J.
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems.
W79-00027 5F

UGGINS, R. B.
Drip Irrigation System.
W79-00038 3F

UNCAN, T. O.
Collection Bucket for Use with Tow Nets for Larval Fish.
W79-00070 7B

Nonmetallic Electrofishing Booms and Accessory Tackle.
W79-00069 7B

DUNSON, J. E.
Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters.
W79-00458 5C

DYRSSEN, D.
Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry.
W79-00151 5G

ECKENFELDER, W. W. JR.
Oxygen Activated Sludge Considerations for Industrial Applications.
W79-00354 5D

EDDE, H.
Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.
W79-00412 5D

EGBUNIWE, N.
Rural Water Supplies from Laterite Runoff.
W79-00387 5F

ELCHAK, T. L.
Water/Energy Management and Evaluation Model for Pennsylvania.
W79-00007 6D

ELEY, R. L.
Arcadia Lake Water-Quality Evaluation.
W79-00463 5C

ELGQUIST, B.
Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry.
W79-00151 5G

ELLIS, J.
Recovery of Tin from Electroplating Solutions and Rinse Waters.
W79-00157 5D

ELLIS, N. H.
Carbon Contact Column.
W79-00028 5D

EMILIANI, F.
Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: I. Statistical Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting. (In Spanish).
W79-00385 5A

ENGBERG, R. A.
Groundwater Quality Atlas of Nebraska.
W79-00252 7C

ETTELT, G. A.
Belt Type Oil Removal Unit.
W79-00040 5G

FABRI, J. O.
Color Removal Process.
W79-00042 5D

FAGERSTROM, T.
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera).
W79-00076 5G

FEDOROV, N. I.
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian).
W79-00018 2I

FIELDING, M. B.
Deflection of P.V.C. Pipe Under Burial Conditions.
W79-00103 8D

FISCHER, W.
Battery Operated Water Purification System.
W79-00043 5F

FISHMAN, M.
Automated Determination of Selenium in Water.
W79-00261 5A

FITZPATRICK, J. A.
Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters.
W79-00371 5D

FORREST, G. I.
The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines.
W79-00202 2I

FOWLER, T.
Applications of Remote Sensing to Hydrologic Planning.
W79-00099 7B

FRANCL, L. J.
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters.
W79-00296 3F

FRENCH, R.
Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.
W79-00412 5D

FRIBERG, F.
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams.
W79-00209 5C

FROMMHAGEN, L. H.
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds.
W79-00353 5D

FROYTAG, A. H.
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters.
W79-00296 3F

FUJIOKA, Y.
Rational Determination of Underdrainage System from the Hydraulic Point of View: Studies on Underdrainage of Clayey Paddy Soil: III. (In Japanese).
W79-00199 2G

FULK, R.
Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations.
W79-00286 5A

FULLER, R. R.
Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation.
W79-00350 5D

FULLERTON, D. G.
Biological Oxidation and Flotation Apparatus and Method.
W79-00030 5D

GAHIN, M.
On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters

with Activated Carbon (Zur Entfernung von Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle).
W79-00410 5D

GARDE, R. J.
Air Entrainment in Radial Flow Towards Intakes.
W79-00315 8B

Vortex Formation at Vertical Pipe Intakes.
W79-00485 8B

GARDINER, D. K.
Textile Waste Waters: Treatment and Environmental Effects.
W79-00166 3E

GARY, H. L.
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type.
W79-00140 4C

GEDNEY, R. T.
Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model.
W79-00132 2H

GIAM, C. S.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve.
W79-00063 5C

GIAQUINTA, A. R.
Wet Cooling Tower Backfitting Economics.
W79-00233 5G

GIESY, J. P. JR.
Uptake of Americum-241 by Algae and Bacteria.
W79-00067 5B

GILBERT, D. W.
Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation.
W79-00350 5D

GILKESON, R. H.
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report.
W79-00003 5A

GILLESPIE, G. W.
Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter.
W79-00433 5D

GILLIAM, J. W.
Nature and Impact of Rural Stream Inputs on Water Quality.
W79-00483 5C

GLOECKLER, F. C.
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System.
W79-00357 5D

GOLDSTEIN, J.
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation.
W79-00246 5G

GOLDSTEIN, R. M.
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys.
W79-00072 7B

GOLUBEVA, G. F.
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian).
W79-00147 2I

GOODWIN, T. E.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve.
W79-00063 5C

GRAMLICH, F. W.
The Demand for Clean Water: The Case of the Charles River.
W79-00234 6B

GRANA, D. C.
Remote Water Monitoring System.
W79-00047 7B

GRANT, J. W.
Steam Stripping Reduces Condensate at Weyco Mill.
W79-00409 3E

GREEN, W.
A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams.
W79-00407 5C

GRENNEY, W. J.
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah.
W79-00145 3C

GREYDANUS, H. W.
Management Aspects of Cyclic Storage of Water in Aquifer Systems.
W79-00386 4B

GRIFFIN, C.
Two-Step Roll Ahead Irrigation System.
W79-00032 3F

GRIFFIN, R. A.
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report.
W79-00003 5A

GRIFFITHS, D. W.
Factors Influencing Induced Air Flotation.
W79-00375 5D

GRIFFITHS, G. A.
Origin and Transport of Large Boulders in Mountain Streams.
W79-00490 2J

GROTTEROD, K.
Looking at the Positive Side of Energy Regulation.
W79-00411 3E

GROVES, D. L.
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management.
W79-00243 6A

GRUBER, D.
Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations.
W79-00286 5A

GUERKE, M. L.
Our Reclamation Future: The Missing Bet on Trees.
W79-00086 4C

HACKBARTH, D.
Hydrogeology of the Grande Prairie Area, Alberta.
W79-00470 2F

HACKNEY, C. T.
Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh.
W79-00338 2L

HALL, R. W. JR.
Arcadia Lake Water-Quality Evaluation.
W79-00463 5C

HALL, S. R.
Case History: Ash Disposal from an Oil Fired Central Station.
W79-00361 5E

HALLENBECK, W. H.
Determination of Chrysotile Asbestos in Rainwater.
W79-00014 5A

Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

HALLENBECK, W. H. JR.
Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pipe.
W79-00435 5B

HALLHAGEN, R. G.
Oil Fence.
W79-00036 5G

HAMILTON, D. A.
Influence of Strip Mines on Regional Ground-Water Flow.
W79-00118 5G

HANKE, S. H.
Land Prices Substantially Underestimate the Value of Environmental Quality.
W79-00244 6C

HANSEN, D. J.
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem.
W79-00061 5B

HARALSON, R. H.
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism.
W79-00378 5D

HARRIS, A.
Treatment of Water or Aqueous Systems.
W79-00039 5F

HARRIS, E. P.
Simple Sampler Activation and Recording System.
W79-00480 7B

HARRIS, F.
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W79-00302 3A

ARRISON, P. J.
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W79-00229 5C

ARTWICK, N. J. R.
Skimming Apparatus.
W79-00025 5G

ATCH, R. W.
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon.
W79-00075 8I

ATTEN, R. E.
New Approach Gets Results in Utah Well.
W79-00181 8B

AUSER, V. L.
Seepage Control by Particle Size Selection.
W79-00484 4A

AUSHILD, W. L.
Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington.
W79-00258 2E

AVRILAK, R. J. JR.
Water Usage Requires Planning.
W79-00183 6D

AYES, E. C.
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W79-00275 7C

AYNES, D. P.
Remote Water Monitoring System.
W79-00047 7B

EARD, W. R.
Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System.
W79-00071 7B

EBENSTREIT, S.
Resource Analysis: Water and Energy as Linked Resources.
W79-00453 6D

EINLE, D. R.
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay.
W79-00494 2L

EISS, H. W.
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W79-00177 8B

EMPHILL, P. F.
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska.
W79-00260 4B

ENGST, B.
Battery Operated Water Purification System.
W79-00043 5F

ENRIKSEN, A.
Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation.
W79-00321 5A

HERN, J. L.
Continuous Electrochemical Synthesis Using a Packed Granular Electrode.
W79-00432 5D

Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite.
W79-00431 5D

HERNANDEZ, D. J.
Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota.
W79-00102 5D

HESSE, C. S.
Determination of Chrysotile Asbestos in Rainwater.
W79-00014 5A

Investigation of Rainwater for the Presence of Asbestos.
W79-00437 5A

Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

HIGGINS, M. A.
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems.
W79-00027 5F

HILTY, J. D.
Automatic System Cleaner for Remote Monitor.
W79-00051 5A

HOKAO, Z.
Sludge Treatment by Supersonic Jet-Flame.
W79-00403 5E

HOLMES, J. W.
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia.
W79-00112 2F

HONG, S.
Activated Sludge System with Staggered Partition Basin.
W79-00055 5D

HORNKE, R.
Development of an Effluent-Free Sulfite Pulp Mill (Entwicklung zur abwasserfrei arbeitenden Sulfitzellstoff-fabrik).
W79-00424 5D

HOSOI, T.
Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.
W79-00412 5D

HSIUNG, D. E.
Three-Dimensional Open Channel Flow.
W79-00312 8B

HUBNER, H.
Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych).
W79-00413 5C

HUETH, D. L.
Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion.
W79-00237 6E

HUFF, D. D.
A Field Evaluation of Subsurface and Surface Runoff. I. Tracer Studies.
W79-00115 2E

A Field Evaluation of Subsurface and Surface Runoff. II. Runoff Processes.
W79-00116 2E

HUFF, F. A.
Relation Between the St Louis Urban Precipitation Anomaly and Synoptic Weather Factors.
W79-00328 2B

HUFF, P. B.
Aerobic Media Trickling Filter Applied to Nitrogen Control.
W79-00445 5D

HUGHES, T. C.
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning.
W79-00002 6A

HUMENIK, F. J.
Nature and Impact of Rural Stream Inputs on Water Quality.
W79-00483 5C

Simple Sampler Activation and Recording System.
W79-00480 7B

HUMPHRIES, T. S.
Low Toxic Corrosion Inhibitors for Aluminum in Fresh Water.
W79-00091 8G

HUMPHRYS, C. R.
Summary of Study Findings, Phase I Report: Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands.
W79-00195 4C

HUNTER, E. J.
Angularity Sensor Means for Center Pivot Irrigation System.
W79-00023 3F

HUNTER, T. A.
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism.
W79-00378 5D

HUNTLEY, H. M.
An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery.
W79-00394 6E

HUNTZINGER, T. L.
High-Flow Frequencies for Selected Streams in Oklahoma.
W79-00273 2E

Low-Flow Characteristics of Oklahoma Streams.
W79-00257 2E

HUPPERT, D. D.
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management.
W79-00240 6E

HUTCHINS, M. L.
Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the Influence of Flushing Rate.
W79-00001 5C

HUTZINGER, O.
Acute and Chronic Oral Toxicity of Chlorinated Dibenzofurans to Salmonid Fishes.
W79-00062 5C

HUYAKORN, P. S.
A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media.
W79-00135 2F

IGNIZIO, J. P.
Water/Energy Management and Evaluation Model for Pennsylvania.
W79-00007 6D

IL'YUSCHCHENKO, T. E.
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis. (In Russian).
W79-00200 2I

IMBERGER, J.
Field Investigation of Selective Withdrawal.
W79-00119 4A

ISU, E. O.
Stream Temperature Estimation Using Kalman Filter.
W79-00121 5B

IVEY, G.
Field Investigation of Selective Withdrawal.
W79-00119 4A

IWANAMI, S.
Process and Apparatus for Separating Oil From Water Contaminated with Oil.
W79-00050 5G

JACKSON, I. J.
Local Differences in the Patterns of Variability of Tropical Rainfall Some Characteristics and Implications.
W79-00113 2B

JACOBS, B.
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations.
W79-00227 5A

JAHNIG, D. G.
Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants.
W79-00356 5D

JAIN, A. K.
Air Entrainment in Radial Flow Towards Intakes
W79-00315 8B

Vortex Formation at Vertical Pipe Intakes.
W79-00485 8B

JANAKIRAM, K.
Control of Aquatic Weed by Moth Larvae.
W79-00197 4A

JANES, J. V. III
Factors Influencing Induced Air Flotation.
W79-00375 5D

JANKOWSKA, T.
Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych).
W79-00413 5C

JARLEVANG, L.
How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer).
W79-00418 3E

JENKINS, S. R.
Transpiration and Evaporation of Sewage Effluent.
W79-00088 5D

JENNE, E. A.
Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability.
W79-00271 5B

JENSEN, L. J.
The Historic Level of Great Salt Lake, Utah.
W79-00264 2H

JENSEN, R. A.
Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures.
W79-00374 5D

JESSUP, D. J.
Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept.
W79-00447 5G

JHA, A. D.
High Temperature Eletrodialysis-Phase VI.
W79-00303 3A

JOHANSEN, H. L.
Water Hardness and Cardiovascular Mortality.
W79-00171 5C

JOHANSSON, T.
How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer).
W79-00418 3E

JOHNSON, D. W.
The Source of American Falls Reservoir Pollutants.
W79-00004 5B

JOHNSON, W. R. III.
A Study for Improving the Aerobic-Media Trickling Filter.
W79-00457 5D

JOHNSTON, R. S.
Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion.
W79-00238 6E

JOLLEY, V. D.
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn.
W79-00500 2G

JONES, C. J.
Adsorption of Some Toxic Substances by Waste Components.
W79-00152 5B

JONES, D. M. A.
Climatology of Instantaneous Rainfall Rates.
W79-00327 2B

JONES, E. B.
Flood Regions in Jamaica.
W79-00330 2E

JONES, J. K.
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay.
W79-00494 2L

JONES, R. W.
Case History: Ash Disposal from an Oil Fired Central Station.
W79-00361 5E

JONES, T. I.
Treatment of Water or Aqueous Systems.
W79-00039 5F

KABEL, R. L.
Transfer of Gases at Natural Air-Water Interfaces.
W79-00127 2L

KAEDING, L. R.
Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park.
W79-00082 5C

KAHALAS, H.
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management.
W79-00243 6A

KALVAITIS, A. N.
The Vertical Planar Motion Mechanism: A Dynamic Test Apparatus for Evaluating Current Meters and Other Marine Instrumentation.
W79-00224 7B

KAMDAR, R.
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds.
W79-00353 5D

KAMINO, E.
Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes.
W79-00404 5D

KAPLYUK, L. F.
Water and Physical Properties of the Sod-Calcareous Soils of the Crimean Foothills (In Russian).
W79-00269 2G

KAPPUS, U.
Rainfall Frequencies for the Persian Gulf Coast of Iran.
W79-00123 2B

KARAMIAN, N. A.
Apparatus for Producing High-Purity Water.
W79-00046 5F

KASAI, M.
Solid-Fluid Contacting Process.
W79-00029 5G

KATHMAN, D.
Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs.
W79-00074 7B

KATOPODES, N.
Computing Two-Dimensional Dam-Break Flood Waves.
W79-00313 8A

AWECKA, B.
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage.
W79-00220 5C

AYA, C. M.
Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone National Park.
W79-00082 5C

ELSO, M. M.
Natural Resource Economics: The Upsetting Discipline.
W79-00242 6B

EMMER, F. N.
Color Removal Process.
W79-00042 5D

ENSON, R. E.
Modeling and Monitoring of Toxic Spills and Toxic Effluents.
W79-00343 5B

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment.
W79-00373 5D

ENT, J. C.
The Source of American Falls Reservoir Pollutants.
W79-00004 5B

HALID, M.
Control of Furrow Infiltration by Compaction.
W79-00481 3F

ILHAM, P.
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation.
W79-00215 5C

ILHAM, S. S.
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation.
W79-00215 5C

INASE, T.
Apparatus for Deploying and Taking Up an Oil Fence.
W79-00048 5G

ING, C. J.
Solvent Extraction for Treatment of Wastewaters from Acetic-Acid Manufacture.
W79-00366 5D

IRSANOV, V. A.
Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka).
W79-00417 5A

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva).
W79-00416 5D

IRSCHMAN, F. C.
Water Distiller with Cone Shaped Condenser.
W79-00045 5F

KITAEVA, S. KH.
Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva).
W79-00415 5A

KITAKOGA, H.
Apparatus for Deploying and Taking Up an Oil Fence.
W79-00048 5G

KJERFVE, B.
Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries.
W79-00488 2L

KNIGHT, R. J.
Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada.
W79-00336 2L

KOEHLER, F.
Nature and Impact of Rural Stream Inputs on Water Quality.
W79-00483 5C

KOEHLER, F. A.
Simple Sampler Activation and Recording System.
W79-00480 7B

KOGAN, SH. I.
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian).
W79-00207 4A

KOISE, H. C.
Pretreatment Land Application of Textile Plant Wastes.
W79-00362 5E

KOLAR, C.
Our Reclamation Future: The Missing Bet on Trees.
W79-00086 4C

KOMANOWSKY, M.
Treatment of Lime-Sulfide Tannery Unhairing Waste.
W79-00026 5D

KOON, J. H.
Oxygen Activated Sludge Considerations for Industrial Applications.
W79-00354 5D

KORHONEN, J.
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode and Various measurement Methods.
W79-00429 5A

KORNOBIS, S.
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges.
W79-00068 5C

KOSIK, J.
Relationships Among Some Physical Properties of Soil (In Slovenian).
W79-00451 2G

KOTERBA, M.
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England.
W79-00446 5E

KOVDA, V. A.
Formation of a Vermiculite Mineral from Ground Water Components (In Russian).
W79-00382 2K

KOVER, F. D.
Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-Chloroethylene, Tetrachloroethylene and ion Exchange Resins.
W79-00283 5A

KOWNACKI, A.
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts).
W79-00221 5C

KOWSAR, A.
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover.
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees.
W79-00475 3B

KRAMER, P.
Progress and Problems in the Study of Plant-Water Interrelations (In Bulgarian).
W79-00187 2I

KRANENBURG, C.
Internal Fronts in Two-Layer Flo.
W79-00486 8B

KRAUSE, T.
On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle).
W79-00410 5D

KREMER, B. P.
Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms.
W79-00208 5C

KREMLING, K.
Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures.
W79-00066 5B

KRIEG, D. R.
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum.
W79-00016 2I

Water Relations and Physiological Activity of Potatoes.
W79-00017 2I

KRIEGER, H.
Analysis of Radioactive Contaminants in By-Products from Coal-Fired Power Plant Operations.
W79-00227 5A

KRUCZYNSKI, W. L.
Vegetative Stabilization of Dredge Spoil in North Florida.
W79-00337 5G

KUDRYASHOVA, R. A.
Clarifier With Suspended Layer of Sediment (Osvetlitel' so vzveshennym sloem osadka).
W79-00421 5D

KUWABARA, K.
Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
W79-00053 5D

KUZNETSOVA, A. E.
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

KYRIAS, G. M.
Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5D

KYSELOWA, K.
Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

LAFRANCE, D. E.
Low-Flow Characteristics of Streams on the Olympic Peninsula, Washington,
W79-00258 2E

LAIRD, N. P.
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

LAKSHMINARAYANA, V.
Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00111 2F

Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00136 2F

LALENA, P. P.
Waste Treatment for a Profit,
W79-00359 5D

LAMB, C. E.
Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California,
W79-00253 7C

LAMBIASE, J. J.
Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
W79-00336 2L

LAND, L. F.
Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,
W79-00262 2E

LANEY, R. L.
Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

LAPPALA, E. G.
Ground-Water Availability in the Hitchcock-Red Willow, Frenchman Valley, and Meeker-Driftwood Irrigation Districts, Southwest Nebraska,
W79-00260 4B

LAPSHIN, N.
Efficiency of Screenless Wells for Irrigation,
W79-00184 3F

LARSSON, A.
Wet Meadows in Southern Sweden: Vegetation, Succession and Management (In Swedish),
W79-00288 2I

LASCANO, R.
Water Relations of Fritted Clays,
W79-00476 2G

LATHE, D. C. C.
Skimming Apparatus,
W79-00025 5G

LATINOPOULOS, P. D.
On the Two-Dimensional Groundwater Movement,
W79-00108 2F

LAUDANI, U.
The Phosphagens of Some Protozoa as Ecological Indicators (In French),
W79-00423 5A

LAUGHLIN, C. P.
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September, 1977,
W79-00275 7C

LAYNE, J. N.
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

LAZAREVA, L. P.
Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

LEE, R. G.
Brushland Watershed Fire Management Policy in Southern California: Biosocial Considerations,
W79-00449 6B

LEE, W. Y.
The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

LEITKO, T.
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6B

LEITZ, F. B.
High Temperature Eletrodialysis-Phase VI,
W79-00303 3A

LESSEM, A. S.
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

LETTENMAIER, D. P.
Climate Change: Detection and Its Impact on Hydrologic Design,
W79-00492 2E

LEUNG, K. S.
River Temperature Variation with Freezing and Storage,
W79-00477 2E

LEVI, E.
Eddy Production Inside Wall Layers,
W79-00333 8B

LEWIS, E. L.
Mixing in an Arctic Fjord,
W79-00487 2L

LEWIS, M.
Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

LEWKE, R. E.
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River Canyon, Washington,
W79-00146 6G

LEZINA, A. N.
Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

LI, N. N.
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process,
W79-00161 5D

LICK, W.
Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

LIMA, P. H.
Asbestos - A Bibliography,
W79-00225 5A

LIN, H. C.
Three-Dimensional Open Channel Flow,
W79-00312 8B

LISKOWITZ, J.
Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

LISKOWITZ, J. W.
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

LITTLEWOOD, I. G.
An Estimate of Annual Runoff from England and Wales, 1728-1976,
W79-00124 2E

LITWIN, Y. J.
Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

LIVINGSTON, R. K.
Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,
W79-00274 4B

LLOYD, J. W.
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

LOATS, H. JR.
Applications of Remote Sensing to Hydrologic Planning,
W79-00099 7B

LOMIDZE, D. V.
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

NDQUIST, C. J.
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79-00274 4B

JNSBURY, M.
esource Analysis: Water and Energy as nked Resources.
79-00453 6D

/ETT, M. B.
ransuranic Nuclides in Plaice (Pleuronectes atessa) from the North-Eastern Irish Sea.
79-00077 5B

P. Y.
ptake and FAte of DI-2-Ethylhexyl Phthalate Aquatic Organisms and in a Model cosystem.
79-00061 5B

VES, W. J.
Method of Measuring Bacterial Growth in quatic Environments Using Dialysis Culture.
79-00109 5A

IME, P. O.
nalyses of Paper Machine Waters with Ion ecific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode d Various measurement Methods.
79-00429 5A

)MA, S. N.
orms of Trace Elements in Soils, Sediments, d Associated Waters: An Overview of Their etermination and Biological Availability.
79-00271 5B

)NS, B. W.
ase History: Ash Disposal from an Oil Fried entral Station.
79-00361 5E

BRY, D. R.
estruction of Trace Toxic Compounds in ater and Sludge by Ionizing Radiation.
79-00370 5D

CISAAC, J. J.
el Cycles of Inorganic Nitrogen Uptake in a atural Phytoplankton Population Dominated Gonyaulax Polyedra.
79-00210 5C

KNOON, R.
onjunctive Use of Ground and Surface ater.
79-00170 4B

LLON, M. H.
oxicity of the Fungicide Captan to the Dungess Crab Cancer Magister.
79-00065 5C

SAM, R.
trate Reductase Activity of Soybeans in lation to other Indicators of Water Stress.
79-00149 2I

SLEY, R. E.
mulation of Flows in Ungaged Basins.
79-00331 2E

SN, A. W.
ydrogeochemistry of a Calcrete-Containing quifer Near Lake Way, Western Australia.
79-00323 2F

MARASCO, R.
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion.
W79-00231 6B

MARCONI, W.
Method for Depolluting Fresh and Sea Water from Petroleum Products.
W79-00058 5G

MARQUARDT, K.
Process for the Treatment of Water Solution by Ion Exchange.
W79-00054 5F

MARSH, T. J.
An Estimate of Annual Runoff from England and Wales, 1728-1976.
W79-00124 2E

MARSHBURN, R.
Pretreatment Land Application of Textile Plant Wastes.
W79-00362 5E

MARTIN, E. N.
Water Filtering and Dispensing Apparatus.
W79-00019 5F

MARTIN, S. B.
Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho.
W79-00427 5C

MARTIN, W. C.
Water Analytical Data as a Tool in Drilling and Production Economics.
W79-00168 8G

MARTINEZ, H. H.
A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania.
W79-00442 8A

Water/Energy Management and Evaluation Model for Pennsylvania.
W79-00007 6D

MARUYAMA, T.
Rational Determination of Underdrainage System from the Hydraulic Point of View: Studies on Underdrainage of Clayey Paddy Soil: III. (In Japanese).
W79-00199 2G

MASON, O.
Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.
W79-00412 5D

MATSON, J. V.
Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant.
W79-00352 5D

MAUK, C. E.
New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection.
W79-00369 5D

MAY, J. A.
Direct Cooling with Ground Water.
W79-00173 8C

MAYES, J. H.
Pretreatment of Industrial Wastes with Ozone.
W79-00368 5D

MAZITOV, L. A.
Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie kationoselektivnoy membrany MK-40 pri elektrodialze otrabotannogo sul'fitnogo shcheloka).
W79-00417 5A

Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva).
W79-00416 5D

Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva).
W79-00415 5A

MCCAULEY, M. N.
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II.
W79-00100 5C

MCENTYRE, C. L.
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash.
W79-00155 5D

MCGINNES, E. A. JR.
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks.
W79-00425 5E

MCGUGAN, P. J.
Adsorption of Some Toxic Substances by Waste Components.
W79-00152 5B

MCINTYRE, R. J.
On the Environmental Efficiency of Economic Systems.
W79-00230 6G

MCKENZIE, G. D.
Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumulations.
W79-00495 2J

MCMORROW, D. J.
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions.
W79-00089 2B

MCNEISH, J. D.
Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon.
W79-00075 8I

MEADOWS, M. E.
Stormwater Modeling.
W79-00381 5B

MEEROVSKAYA, V. I.
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii).
W79-00402 5D

MEHDIZADEH, P.
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover.
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees.
W79-00475 3B

MELFI, D. A.
Total Phosphorus Transport During Storm Events.
W79-00478 5B

MERRILL, E. W.
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation.
W79-00370 5D

METCALF, R. L.
Uptake and Fate of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem.
W79-00061 5B

MEYER, R. L.
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir.
W79-00011 5C

MILLEMANN, R. E.
Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister.
W79-00065 5C

MILLER, T. D.
Water Relations and Physiological Activity of Potatoes.
W79-00017 2I

MILLICAN, J. H.
EPA's Goal for Suspended Solids is Not Met with Media Filtration.
W79-00414 5D

MILLS, B.
Treatment of Effluent.
W79-00024 5D

MINDAY, R. M.
Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process.
W79-00161 5D

MINDLER, A. B.
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor.
W79-00301 3A

MISTINA, T.
Relationships Among Some Physical Properties of Soil (In Slovenian).
W79-00451 2G

MISUMI, T.
Solid-Fluid Contacting Process.
W79-00029 5G

MITCHELL, B.
An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery.
W79-00394 6E

MITCHELL, R.
Studies in Microbial Chemotactic Behavior in Seawater.
W79-00293 5C

MITSCH, W. J.
Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central Florida Marsh.
W79-00206 5C

MIYAJI, T.
Solid-Fluid Contacting Process.
W79-00029 5G

MOLLS, F. B.
Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model.
W79-00132 2H

MOLZ, F. J.
Transpiration and Evaporation of Sewage Effluent.
W79-00088 5D

MONTGOMERY, J. R.
A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations.
W79-00325 5A

MOON, R. E.
The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study.
W79-00204 5C

MOORE, J. E.
Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977.
W79-00272 4A

MOORE, N. Y.
Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on Price.
W79-00438 6A

MORA-CASTRO, D.
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica.
W79-00311 2F

MOREAU, J-P.
Effects of Municipal Sewage Effluent Irrigation on the Trace Metal Content of Earthworms.
W79-00009 5C

MORGAN, R. P. C.
The Application of Linear Programming to Run-Off Management.
W79-00393 4A

MORRISON, T. J.
A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water.
W79-00455 5G

MORTON, J. F.
Cattails (Typha Spp.)--Weed Problem or Potential Crop.,
W79-00198 2I

MOSOLOVA, A. I.
Possible Use of Polymeric Materials for Fortification of Drainage Fills (In Russian).
W79-00439 4A

MUIR, L. R.
A General Two Dimensional River Simulator,
W79-00397 2E

MURPHY, P. G.
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond.
W79-00205 5C

MURRAY, S. P.
Inertial Currents Over the Inner Shelf Near 30 Degree N.
W79-00133 2L

MURTY, V. V. N.
Pollution of Groundwater Through Nonlinear Diffusion.
W79-00110 5B

MYERS, W. A.
Pretreatment of Industrial Wastes with Ozone.
W79-00368 5D

MYERS, W. R. C.
Momentum Transfer in a Compound Channel.
W79-00334 8B

NADEAU, R. J.
The Biological Effects of Toxic Material Spills.
W79-00344 5C

NAGAI, T.
The Radiation-Induced Degradation of Lignin in Aqueous Solutions.
W79-00164 5D

NAGELL, B.
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera).
W79-00076 5C

NAKAJIMA, M.
Method for Clarifying Aqueous Waste Liquid Containing Acid Dyes.
W79-00053 5D

NAPOLI, D.
Process for Removing Mercury and Mercury Salts from Liquid Effluents.
W79-00056 5D

NARAYANAN, R.
Pressure Fluctuations Beneath Submerged Jump.
W79-00316 8

NARDONE, F.
Process for Removing Mercury and Mercury Salts from Liquid Effluents.
W79-00056 5

NEAL, J. A.
Clarification Process.
W79-00041 5

NEBOLSINE, R.
New Developments in Oil Interception by Filtration.
W79-00364 5

NERI, L. C.
Water Hardness and Cardiovascular Mortality
W79-00171

NEROZIN, S. A.
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii).
W79-00402

NICOL, J. A. C.
The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale.
W79-00081

KISHINA, E. F.
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

LSSON, L. M.
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

SKANEN, W. A.
Land Prices Substantially Underestimate the Value of Environmental Quality,
W79-00244 6C

EMDIRIM, L. C.
Flood Regions in Jamaica,
W79-00330 2E

BLE, D. H.
The Application of Linear Programming to Run-Off Management,
W79-00393 4A

DA, M.
Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

F, D.
On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System,
W79-00131 2L

On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System,
W79-00497 2L

ICHL, O. J.
Activated Sludge System with Staggered Partition Basin,
W79-00055 5D

MURA, K.
Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

RTON, V. J.
Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

VIKOVA, A. F.
Reclamation of Meadow-Chernozem Solonetzes of the Kustanai Oblast. (In Russian),
W79-00395 2G

AGU, J. O.
Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin.
W79-00339 5A

RZUT, J. J.
Controls Drive Platers to Materials Recovery.
W79-00154 5D

SUM, J. A.
How Kind to the Resources is the Grinding Process. (Hvor ressursvennlig er slipeprosessen),
W79-00408 3E

TBO, K.
Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

OLIVIERI, R.
Method for Depolluting Fresh and Sea Water from Petroleum Products,
W79-00058 5G

OMAROV, M. O.
Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR,
W79-00320 2H

OSTERKAMP, T. E.
Frazil Ice Formation: A Review,
W79-00120 2C

OSTROBROD, B. G.
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

OTTO, C.
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

OVERCASH, M. R.
Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

OVERTON, D. E.
Stormwater Modeling,
W79-00381 5B

OWENS, E. L.
Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

PACKARD, T. T.
Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton,
W79-00212 5C

PAINE, D.
Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

PAL, D.
Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

PARKER, C. E.
Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

PARSONS, D. K.
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters,
W79-00296 3F

PARSONS, T. B.
Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

PARTRIDGE, F. E.
Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,
W79-00428 8I

PATEL, K.
Final Report on Field Test Evaluation and Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility, November 1976,
W79-00302 3A

PATEL-MANDIK, K.
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water,
W79-00013 5A

PATEL, V. C.
Wet Cooling Tower Backfitting Economics,
W79-00233 5G

PATRON, G.
Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

PEARSON, C-A.
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

PEKHOVICH, A. I.
Allowing for the Water Permeability of Frozen Ground Screens During their Formation,
W79-00467 8D

PELTIER, R. V.
Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

PENTREATH, R. J.
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
W79-00077 5B

PEQUEGNAT, W. E.
Aquatic Biotal Monitor,
W79-00033 5A

PERETYATKO, A. I.
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

PERKIN, R. G.
Mixing in an Arctic Fjord,
W79-00487 2L

PERNA, A. J.
Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism,
W79-00378 5D

Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

PERSONS, J. L.
Heat Pump Accessories Can Save You Money,
W79-00174 8C

PETERKA, J. J.
Relationship of Rainfall and Lake Groundwater Seepage,
W79-00489 5B

PETERSON, A. E.
Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5E

PETRISHCHEVA, E. A.
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthesis, (In Russian),
W79-00200 2I

PFISTER, K.
Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences.
W79-00419 5D

PHILIP, J. R.
Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications.
W79-00472 2G

PHIPPS, G. L.
Asbestos - A Bibliography.
W79-00225 5A

PICKERING, J. A.
A Model for Evaluating Alternative Land Developments Around Lakes.
W79-00460 4C

PICKUP, G.
Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands.
W79-00491 2A

PIERRE, W. H.
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with Corn.
W79-00500 2G

PILGRIM, D. H.
A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies.
W79-00115 2E

A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes.
W79-00116 2E

PINDER, G. F.
A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media.
W79-00135 2F

PIUZE, J.
Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures.
W79-00066 5B

PLATTS, W. S.
Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern Idaho.
W79-00427 5C

Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho.
W79-00428 8I

PLUMB, R. H.
Arcadia Lake Water-Quality Evaluation.
W79-00463 5C

PONTIUS, F. W.
Characterization and Treatment of Stormwater Runoff.
W79-00005 5B

POST, F. J.
A Procaryotic Intracellular Symbiont of the Great Salt Lake Brine Shrimp Artemia Salina (L.).
W79-00298 2H

Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah.
W79-00297 2H

POTTER, M. F.
The Application of Linear Programming to Run-Off Management.
W79-00393 4A

POULIOT, P. W.
Case History: Ash Disposal from an Oil Fired Central Station.
W79-00361 5E

POWERS, W. L.
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress.
W79-00149 2I

PRENGLE, H. W. JR.
New Technology: Ozone/UV Chemical Oxidation Wastewater Process for Metal Complexes, Organic Species and Disinfection.
W79-00369 5D

PRICE, M. T.
A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations.
W79-00325 5A

PRUDNIKOV, A. D.
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian).
W79-00284 2G

PUGNER, P. E.
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning.
W79-00002 6A

PURRINGTON, J. M.
Management Plan for Control and Treatment of Toxic Substances.
W79-00346 5G

PURSELL, C. F.
Our Reclamation Future: The Missing Bet on Trees.
W79-00086 4C

PYEN, G.
Automated Determination of Selenium in Water.
W79-00261 5A

QUINLAN, P. M.
Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition.
W79-00052 5F

QUINN, F. H.
Lake Superior Regulation Effects.
W79-00388 4C

RAB, E.
Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms.
W79-00073 5A

RAJAGOPALAN, S. P.
Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers.
W79-00111 2F

Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers.
W79-00136 2F

RAJU, K. G. R.
Air Entrainment in Radial Flow Towards Intakes.
W79-00315 8B

RAMAKRISHNA, T. S.
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District, Maharashtra.
W79-00107 4B

RAMER, J. L.
Method for Treating Sewage.
W79-00044 5D

RANDALL, J. H.
Chlorofluorocarbons as Hydrologic Tracers A New Technology.
W79-00461 5A

Tracing Sewage Effluent Recharge - Tucson Arizona.
W79-00299 5A

RANDOLPH, A. D.
Hydrolysis of Iron from Acidic Liquors.
W79-00228 5D

RANGA RAJU, K. G.
Vortex Formation at Vertical Pipe Intakes.
W79-00485 8B

RAO, K. R.
Toxicity of Sodium Pentachlorophenate (NA PCP) to the Grass Shrimp, Palaemonetes Pugio at Different Stages of the Molt Cycle.
W79-00078 5C

RAPHAEL, D. L.
Water/Energy Management and Evaluation Model for Pennsylvania.
W79-00007 6A

RATHBUN, R. E.
Laboratory Studies of Gas Tracers for Reaeration.
W79-00270 5B

RATTI, G.
Process for Removing Mercury and Mercury Salts from Liquid Effluents.
W79-00056 5D

RAYMOND, R. H.
Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona.
W79-00251 7C

REIZES, J. A.
Numerical Study of Continuous Saltation.
W79-00314 8B

RESENDEZ MEDINA, A.
Study of the Fishes of the Lagoon of Alvarado Veracruz, Mexico (In Spanish).
W79-00079 2L

RETI, A. R.
Molecular Fractionation by Staged Ultrafiltration.
W79-00367 5D

RHEE, G. Y.
Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition and Nitrate Uptake.
W79-00211 5C

RICHARD, M. R.
What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies.
W79-00179 5F

CHARDSON, D. R.
Vegetation of Southeastern Florida -- Parts II - V,
W79-00196 2I

CKER, N. L.
Solvent Extraction for Treatment of Wastewaters from Acetic-Acid Manufacture,
W79-00366 5D

LEY, J. P.
Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

ZAEV, N. U.
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),
W79-00402 5D

ACH, J. A. G.
dentification of Kepone Alteration Products in Soil and Mullet,
W79-00080 5A

BERT, J. M.
First Ecological Data on the Oyster Ponds in he Bay of Bourgneuf (In French),
W79-00295 2L

BERTIELLO, A.
Method for Depolluting Fresh and Sea Water rom Petroleum Products,
W79-00058 5G

CK, D.
Pretreatment Land Application of Textile Plant Wastes,
W79-00362 5E

ESLER, F. C.
Treatment of Solids-Liquid-Gas Mixtures,
W79-00022 5D

OS, D. V. D. S.
Hailstone Size inferred from Dents in Cold-Rolled Aluminum Sheet,
W79-00139 7B

SE, M.
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation,
W79-00246 5G

SENDAHL, P. C.
Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5B

SS, B. B.
. Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

UBA, J.
Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych),
W79-00413 5C

FF, J. F.
Shunt Meters with Segmental Orifices,
W79-00335 3F

RUKVICHAI, C.
Operating Model for the Green River Basin Reservoir System,
W79-00452 4A

SALTER, F. H.
Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
W79-00071 7B

SAMESHIMA, K.
Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
W79-00404 5D

SATO, K.
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

SAUNDERS, G. W.
Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

SCHAD, T. M.
The National Water Commission Revisited Perspective on National Water Policy Studies, with some Implications for Changes in Future Water Policy,
W79-00383 6E

SCHAU, H. C.
Simple Model for Ocean Outfall Plumes,
W79-00479 5B

SCHIEBE, F. R.
Control of Water Residence Time in Small Reservoirs,
W79-00482 4A

SCHILLER, A. M.
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

SCHIPPER, I. A.
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

SCHULTZ, T. R.
Chlorofluorocarbons as Hydrologic Tracers A New Technology,
W79-00461 5A

Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

SCHULZ, R. B.
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

SCHUMACHER, J. D.
Regional Response to Forcing in Southern Strait of Georgia,
W79-00324 2L

SCHUTH, C. K.
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem,
W79-00061 5B

SCHWARTZMAN, E. H.
Energy Conversion System,
W79-00037 4B

SCHWERI, W. F. II
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

SEELIG, W. N.
Hydraulics of Great Lakes Inlets,
W79-00469 8B

SEIBEL, E.
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded Material,
W79-00249 5B

SEIM, W.
Bioassay Results of Kraft Mill Effluent at Artificially Elevated Levels of Biosolids,
W79-00406 5C

SELIGER, H. H.
Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

SEPHTON, H. H.
Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater,
W79-00015 3A

SEWELL, W. R. D.
Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

SHANHOLTZ, V. O.
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

SHEARER, M. T.
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

SHEIH, M.
Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

SHELBY, S. E.
Oxygen Activated Sludge Considerations for Industrial Applications,
W79-00354 5D

SHENG, Y. P.
Numerical Computation of Three-Dimensional Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
W79-00132 2H

SHERMA, J.
Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples,
W79-00287 5A

SHERRILL, M. G.
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W79-00256 5B

SHIH, S. F.
Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

SHIH, W. F. P.
Use of Dummy Variables in Water Resources Studies,
W79-00114 2G

SHIVAS, S. A. J.
The Environmental Effects of Chromium in Tannery Effluents,
W79-00156 5C

SHULTZ, D. J.
Laboratory Studies of Gas Tracers for Reaeration,
W79-00270 5A

SHUMWAY, S. E.
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),
W79-00083 5C

SIMONS, T. J.
Generation and Propagation of Downwelling Fronts,
W79-00128 2H

SIMPSON, R.
Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

SIMS, A. L.
Climatology of Instantaneous Rainfall Rates,
W79-00327 2B

SINGH, K. P.
Optimal Operation of Shelbyville and Carlyle Lakes,
W79-00392 4A

SINNAMON, H. I.
Treatment of Lime-Sulfide Tannery Unhairing Waste,
W79-00026 5D

SIVADJIAN, J.
Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French),
W79-00247 2D

SJOSTROM, E.
Characterization of Spent Bleaching Liquors Part I. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences,
W79-00419 5D

SJOSTROM, P.
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

SKIDMORE, E. L.
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,
W79-00149 2I

SLAYMAKER, O.
Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

SLEATH, J. F. A.
Measurements of Bed Load in Oscillatory Flow,
W79-00141 2J

SLOOFF, W.
Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

SLOSS, J. M.
Free-Surface Seepage Problem,
W79-00496 8D

SMILES, D. E.
Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical Implications,
W79-00472 2G

SMIRNOVA, V. A.
Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elektrodializ otrabotannogo shcheloka sul'fitnotsellyuloznogo proizvodstva),
W79-00416 5D

Flame-Photometric Method for the Determination of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul'fitnotsellyuloznogo proizvodstva),
W79-00415 5A

SMITH, A. J.
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

SMITH, C. R.
Treatment of Effluent,
W79-00024 5D

SMITH, D. R.
Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model,
W79-00468 2B

SMITH, F. J.
Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion,
W79-00238 6E

SMITH, J. L.
Control of Furrow Infiltration by Compaction,
W79-00481 3F

SMITH, R. A. H.
The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines,
W79-00202 2I

SMITH, R. C.
Optical Classification of Natural Waters,
W79-00318 2L

SNIEDOVICH, M.
Dynamic Programming and the Principle of Optimality: A Systematic Approach,
W79-00396 6A

SONG, C. C. S.
River Temperature Variation with Freezing and Storage,
W79-00477 2E

SONG, D. S.
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

SORENSEN, R. M.
Hydraulics of Great Lakes Inlets,
W79-00469 8B

SPALDING, R. F.
Groundwater Quality Atlas of Nebraska,
W79-00252 7C

SPECHT, S. A.
Geologic Studies to Identify the Source fo
High Levels of Radium and Barium in Illinoi
Ground-Water Supplies: A Preliminary Report,
W79-00003 5A

SPIERENBURG, T. P.
Continuous Standard Water Delivery Systen
for Bioassays with Aquatic Organisms,
W79-00073 5A

SPRINGER, E. P.
Influence of Nitrogen Fertilization on th
Quality and Quantity of Streamflow from
Forested Watershed,
W79-00448 5I

SROKOSZ, K.
Phytophilous Fauna in Ponds Fertilized wit
Sugar Factory Wastes,
W79-00217 5C

STALLCUP, J. A.
Fish and Wildlife Inventory of the Seven-Cou
ty Region Included in the Central Florid
Phosphate Industry Area-Wide Environmenta
Impact Study. Volumes I and II,
W79-00100 5C

STANKEVICH, R.
Efficiency of Screenless Wells for Irrigation,
W79-00184 3

STARZECKA, A.
Biocenosis of a High Mountain Stream Unde
the Influence of Tourism. 2. Bacteria as a
Index of Water Pollution on the Rybi Potok
Stream,
W79-00219 5C

STEELE, T. D.
A Field Evaluation of Subsurface and Surfac
Runoff, II. Runoff Processes,
W79-00116 2

STEIMLE, S. E.
Effects of Dissolved Oxygen in the Oxygen
tion Activated Sludge Process,
W79-00351 5D

STEINER, G. R.
Removal of Complex Copper-Ammonia Ion
from Aqueous Wastes with Fly Ash,
W79-00155 5D

Use of Wastewater Treatment Ponds at TV
Fossil Fueled Power Plants,
W79-00356 5D

STEPHENS, D. W.
Laboratory Studies of Gas Tracers for Reaer
tion,
W79-00270 5A

STEVENS, M. D.
Ground-Water Levels in Wyoming, 1977,
W79-00259 7C

STEVENS, R. G.
Water Relations and Physiological Activity
Potatoes,
W79-00017 3F

STOKES, G. N.
Asbestos - A Bibliography,
W79-00225 5A

STORCH, T. A.
Phytoplankton Extracellular Release and I
Relation to the Seasonal Cycle of Dissolved O
ganic Carbon in a Eutrophic Lake,
W79-00213 5C

OREY, D. J.
Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
W79-00245 5G

RELKOFF, T.
Computing Two-Dimensional Dam-Break Flood Waves,
W79-00313 8A

RZELECKA, B.
Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena toksycznosci ostrej wybranych srodkow pomocniczych),
W79-00413 5C

UDLICK, J. R. J.
Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumulations,
W79-00495 2J

UFF, R. G.
Soil Moisture Budget Model Accounting for Shallow Water Table Influences,
W79-00473 2G

VROVA, N. V.
Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

BRAHMANYAM, C. B.
Vegetative Stabilization of Dredge Spoil in North Florida,
W79-00337 5G

NDARAM, S.
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

TER-WEIDER, P.
On the Vertical Distribution and Seasonal Development of the Density of Dreissena Polymorpha Larvae in the Pelagic Zone of the Lake of Zurich (In German),
W79-00280 5F

ZUKI, N.
The Radiation-Induced Degradation of Lignin in Aqueous Solutions,
W79-00164 5D

ARZ, J. J.
Color Removal Process,
W79-00042 5D

ENSSON, B. W.
Diversity and Environments of Benthic Invertebrate Communities in South Swedish Streams,
W79-00209 5C

ANSON, C. L.
Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00371 5D

ARTS, F. A.
Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

EENEY, C. D.
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
W79-00459 5B

SYZDEK, L. D.
Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

SZOPA, P. S.
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

TABAKIN, R. B.
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

TACCHI, K. J.
Critical Analysis of Flotation Performance,
W79-00376 5D

TAI, D. Y.
Laboratory Studies of Gas Tracers for Reaeration,
W79-00270 5A

TAKAHASHI, T.
Mechanical Characteristics of Debris Flow,
W79-00117 2J

TAKAMURA, N.
Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
W79-00404 5D

TAKIMOTO, K.
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

TANNER, C. E.
Remote Monitoring of Coal Strip Mine Rehabilitation,
W79-00226 5G

TAYAMA, H.
Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

TEAGUE, J. D.
Stabilization of Earth Subsurface Layers,
W79-00035 8D

TEARE, I. D.
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,
W79-00149 2I

TENNYSON, L. C.
A Note on Effects of Sewage Effluent Irrigation on Specific Gravity and Growth Rate of White and Red Oaks,
W79-00425 5E

THACKER, W. C.
Comparison of Finite-Element and Finite-Difference Schemes. Part I: One-Dimensional Gravity Wave Motion,
W79-00129 2L

Comparison of Finite-Element and Finite-Difference Schemes. Part II: Two-Dimensional Gravity Wave Motion,
W79-00130 2L

THIBAULT, G. T.
Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

THOMAS, R. G.
Shortest Path Problems in Hydrogeology,
W79-00137 6A

THORNTON, J. R.
On the Environmental Efficiency of Economic Systems,
W79-00230 6G

THORNTON, K. W.
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

THURNAU, R. C.
Ion Selective Electrodes in Water Quality Analysis,
W79-00223 5A

TILMAN, D.
Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
W79-00215 5C

TOLIKAS, D. K.
On the Two-Dimensional Groundwater Movement,
W79-00108 2F

TOMPKINS, T.
A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
W79-00285 5A

TRACY, K. D.
Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

TRAINA, V. J.
Aboveground Sprinkling Device for Sprinkling System,
W79-00059 3F

TRATTNER, R.
Oil/Water Separation Technology: The Options Available - Part 2,
W79-00158 5G

Sorption Capabilities of Various Materials for Leachate Treatment,
W79-00377 5D

TRUBIN, A. I.
Formation of a Vermiculite Mineral from Ground Water Components (In Russian),
W79-00382 2K

TRUITT, M. M.
Water Well Development Decisions,
W79-00167 8B

TRUMP, J. G.
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
W79-00370 5D

TSCHIDER, S. R.
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
W79-00148 5C

TSUDA, S.
Degradation of Aqueous Phenol Solution by Gamma Irradiation,
W79-00153 5D

TSYTOVICH, N. A.
Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

TUBIELLO, G.
Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00056 5D

TUCKER, J. H.
Asbestos - A Bibliography,
W79-00225 5A

TURNER, M.
Solid State Event Recorder for Rainfall Measurement,
W79-00125 2B

TURNER, M. T.
Waste Water Treatment and Re-use within the Textile Industry,
W79-00165 5D

TURNER, W. M.
Oil-Troubled Water,
W79-00169 5B

TUTUNJIAN, R. S.
Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

TYLER, M. A.
Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay,
W79-00317 5C

TYULDYUKOV, V. A.
A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
W79-00284 2G

ULABY, F. T.
Agricultural and Hydrological Applications of Radar: Final Report,
W79-00464 7B

UNNY, T. E.
A General Two Dimensional River Simulator,
W79-00397 2E

URI, N. D.
The Optimal Pricing of Undepletable Externalities,
W79-00239 6C

URUSHADZE, T. F.
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices, (In Russian),
W79-00401 4C

UTKAEVA, V. F.
Possible Use of Polymeric Materials for Fortification of Drainage Fills (In Russian),
W79-00439 4A

VAN BAVEL, C. H. M.
Water Relations of Fritted Clays,
W79-00476 2G

VAN VALKENBURG, S. D.
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake Bay,
W79-00494 2L

VAN WILLIGEN, J.
Organized Resistance to an Imposed Environmental Change. A Reservoir in Eastern Kentucky,
W79-00142 6B

VASELESKI, R. C.
The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

VAZIRI, E.
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

VERHOFF, F. H.
Total Phosphorus Transport During Storm Events,
W79-00478 5B

VERMEULEN, A. J.
Acid Precipitation in the Netherlands,
W79-00138 5A

VESILOV, V. A.
Using Ice as Water-Impermeable Element in Rockfill Dams,
W79-00466 8D

VETROVA, L. A.
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian),
W79-00147 2I

VIKLUND, H. I.
High Temperature Elctrodialysis-Phase VI,
W79-00303 3A

VILKER, V. L.
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,
W79-00353 5D

VINOGRADOVA, G. V.
Correlation Between the Salt Content in the Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irrigation, (In Russian),
W79-00203 2G

VOGEL, J. L.
Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,
W79-00328 2B

VOIGHT, D.
Nekoosa Cleans Condensates with Steam Distillation,
W79-00162 5D

VOLZ, M. G.
Denitrifying Bacteria Can be Enumerated in Nitrite Broth,
W79-00498 2G

VON BROCKEL, K.
Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures,
W79-00066 5B

VONNEGUT, B.
Electric Rainfall Intensity Sensor,
W79-00329 2B

WADDEL, W. W.
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
W79-00188 5B

Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
W79-00190 5B

User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
W79-00189 5B

A Water Quality Model for the South Platte River Basin, Documentation Report,
W79-00398 5B

WAITE, T. D.
Transport Characteristics of Phosphorus in Channelized and Meandering Streams,
W79-00391 5I

WALKER, W. G.
Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5I

WALTON, R. G.
The Development of the Electrical Power System in the Pacific Northwest, A Public Policy Perspective,
W79-00143 6

WATKINS, F. A.
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, September 1977,
W79-00275 7

WATSON, D. S.
Effect of Whey Application on Chemical Properties of Soils and Crops,
W79-00363 5

WATT, J. P. C.
Field Observations of the Moisture Regime of Yellow-Grey Earth (Otokia Silt Loam) in Eastern Otago,
W79-00310 2

WEAKLEY, W. P.
Residential Water Conservation,
W79-00440 3

WEBER, R. B.
Biological Oxidation and Flotation Apparatus and Method,
W79-00030 5

WELDAY, J. M.
Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,
W79-00348 5

WELSH, B. L.
The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
W79-00441 2

WENGER, D.
A Comparative Study of Community Response to Water Related Problems,
W79-00010 6

WETZEL, R. G.
An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond,
W79-00205 2

WHIGHAM, D.
Growth, Mortality, and Biomass Partitioning of Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 2

WHILLANS, I. M.
Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00340 2C

WHITMORE, F. C.
A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

WHITTEMORE, D. O.
Factors Controlling Variations in River Water Quality in Kansas,
W79-00006 5B

WHITTON, R. W.
Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00157 5D

WILDISH, D. J.
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

WILKINS, G. E.
Biological Effects and Environmental Aspects of 1,3-Butadiene,
W79-00292 5C

WILLIAMS, A. F.
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

WILLIAMS, D. C. JR.
A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

WILLIAMS, R. D.
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

WILSON, D. R.
Water Relations of Fritted Clays,
W79-00476 2G

WILSON, J. L.
Influence of Strip Mines on Regional Ground-Water Flow,
W79-00118 5G

WILSON, L. G.
Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

WILSON, S. A.
Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
W79-00436 1B

WILSON, W. B.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

WINIKKA, C. C.
Maps Showing Water-Level Declines, Land Subsidence, and Earth Fissures in South-Central Arizona,
W79-00251 7C

WISEMAN, W. J. JR.
Inertial Currents Over the Inner Shelf Near 30 Degree N,
W79-00133 2L

WITSCHONKE, C. R.
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

WITTWER, R. F.
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a Forested Watershed,
W79-00448 5B

WOINSKY, S. G.
Process and System for Recovery of Energy from Geothermal Brines and Other Water Containing Sources by Direct Contact with a Working Fluid Below the Critical Pressure,
W79-00049 4B

WOLFF, A. H.
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,
W79-00013 5A

WONG, C. S.
Studies on the Pathways and Effects of Cadmium in Controlled Ecosystem Enclosures,
W79-00066 5B

WOOD, W. S.
Safety Aspects of Toxic and Hazardous Spills,
W79-00345 5G

WOOLFENDEN, G. E.
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

WORLEY, D. J.
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

WRIGHT, J. E. JR.
Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sulfuric Acid Solutions and Mine Acid Polluted Waters,
W79-00458 5C

WRIGHT, P. J.
Stabilization of Earth Subsurface Layers,
W79-00035 8D

WRIGHT, R. F.
Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,
W79-00321 5A

WRIGHT, S. J.
Adsorption of Some Toxic Substances by Waste Components,
W79-00152 5B

WULLSCHLEGER, R.
Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations,
W79-00286 5A

YANO, I.
Apparatus for Deploying and Taking Up an Oil Fence,
W79-00048 5G

YOCUM, F. H.
Pretreatment of Industrial Wastes with Ozone,
W79-00368 5D

YOMTOVIAN, I.
Lake Level Control and Management--A Case Study,
W79-00390 4A

YOSHIOKA, T.
Process and Apparatus for Separating Oil From Water Contaminated with Oil,
W79-00050 5G

YOUSSEF, N. N.
A Procaryotic Intracellular Symbiont of the Great Salt Lake Brine Shrimp Artemia Salina (L.),
W79-00298 2H

ZAFFARONI, N. P.
The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

ZASLAVSKII, M. N.
Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian),
W79-00462 2J

ZAVANELLA, T.
The Toxicity of Manganese Ethylenebisdithiccarbamate to the Adult Newt, Triturus Cristatus,
W79-00064 5C

ZEMAN, L. J.
Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
W79-00332 5B

ZIMMERMANN, C. F.
A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations,
W79-00325 5A

ZIMMERMANN, U.
On the Vertical Distribution and Seasonal Development of the Density of Dreissena Polymorpha Larvae in the Pelagic Zone of the Lake of Zurich (In German),
W79-00280 5F

ZITKO, V.
Acute and Chronic Oral Toxicity of Chlroinated Dibenzofurans to Salmonid Fishes,
W79-00062 5C

ZORBA, A. S.
On the Two-Dimensional Groundwater Movement,
W79-00108 2F

ZUCKERMAN, M. M.
Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00360 5D

ORGANIZATIONAL INDEX

. SJUNTORP (SWEDEN). (ASSIGNEE).
il Fence,
/79-00036 5G

RICULTURAL RESEARCH SERVICE,
FORD, MS. SEDIMENTATION LAB.
ontrol of Water Residence Time in Small
eservoirs,
/79-00482 4A

FORCE ARMAMENT LAB., EGLIN AFB.,

pecies Diversity Indices of the Fish Popula-
ons of Streams Draining Selected Test Areas
Eglin Air Force Base Reservation Florida,
79-00277 7C

FORCE ENVIRONMENTAL TECHNICAL
LICATIONS CENTER, SCOTT AFB, IL.
Technique for Estimating Clock Two-Hourly
ecipitation Rate Distributions,
79-00089 2B

PRODUCTS AND CHEMICALS, INC.,
ENTOWN, PA. (ASSIGNEE).
ctivated Sludge System with Staggered Parti-
n Basin,
79-00055 5D

CO INDUSTRIAL GASES DIV., MURRAY
, NJ.
I Control Systems Using Carbon Dioxide,
79-00365 5D

DEMIYA NAUK SSSR, MOSCOW.
HVENNYI INST.
clamation of Meadow-Chernozem
lonetzes of the Kustanai Oblast, (In Rus-
n),
79-00395 2G

DEMIYA NAUK SSSR, PUSHCHINO. INST.
GROCHEMISTRY AND SOIL SCIENCES.
rmation of a Vermiculite Mineral from
ound Water Components (In Russian),
79-00382 2K

DEMIYA NAUK TURKMENSKOI SSR,
KHABAD. INST. BOTANIKI.
ergrowing of the Kara Kum Canal and Some
ereffects of Introducing the White Amur
Water Bodies, (In Russian),
9-00207 4A

SKA UNIV., COLLEGE. GEOPHYSICAL

zil Ice Formation: A Review,
9-00120 2C

NY INTERNATIONAL CO., DEDHAM,
FRL DIV.
oratory Studies on Advanced Composite H
lodules for Seawater Reverse Osmosis,
9-00300 3A

RICAN COLLOID CO., SKOKIE, IL.
GNEE).
hod and Composition for Preventing Water
taminated with Industrial Waste Seeping
ough Soil Containing Said Water,
9-00034 5G

RICAN CYANAMID CO., STAMFORD, CT.
Water Separation Technology: The Options
ilable - Part 2,
9-00158 5G

AMERICAN CYANAMID CO., STAMFORD, CT. (ASSIGNEE).
Low Molecular Weight Hydrolyzed Polyacrylamide Used as a Scale Inhibitor in Water Systems,
W79-00027 5F

AMERICAN GROUND WATER CONSULTANTS, ALBUQUERQUE, NM.
Oil-Troubled Water,
W79-00169 5B

AMERICAN INST. OF CHEMICAL ENGINEERS, NEW YORK.
Water -- 1977.
W79-00342 5D

AMERICAN MUSEUM OF NATURAL HISTORY, PLACID, FL. ARCHBOLD BIOLOGICAL STATION.
Fish and Wildlife Inventory of the Seven-County Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,
W79-00100 5C

ARGONNE NATONAL LAB. IL.
Quantitative Comparison of Seining and Underwater Observation for Stream Fishery Surveys,
W79-00072 7B

ARIZONA STATE UNIV., TEMPE. DEPT. OF ZOOLOGY.
Aquatic Inhabitants of a Mine Waste Stream in Arizona,
W79-00426 5C

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
Natural Resource Economics: The Upsetting Discipline,
W79-00242 6B

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Tracing Sewage Effluent Recharge - Tucson, Arizona,
W79-00299 5A

Chlorofluorocarbons as Hydrologic Tracers A New Technology,
W79-00461 5A

ARIZONA UNIV. TUCSON. DEPT. OF PLANT SCIENCES.
Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters,
W79-00296 3F

ARIZONA UNIV., TUSCON. DEPT. OF CHEMICAL ENGINEERING.
Hydrolysis of Iron from Acidic Liquors,
W79-00228 5D

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Determination of Terrestrial Albedo from LANDSAT I Satellite Imagery in Photographic Form,
W79-00012 7B

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF BOTANY AND BACTERIOLOGY.
The Effects of Heavy Metals on Algae Populations in a South Central Reservoir,
W79-00011 5C

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. ENVIRONMENTAL EFFECTS LAB.
Arcadia Lake Water-Quality Evaluation,
W79-00463 5C

ASHI KASEI KOGYO KABUSHIKI KAISHA, OSAKA (JAPAN). (ASSIGNEE).
Solid-Fluid Contacting Process,
W79-00029 5G

AUBURN UNIV., AL. ENGINEERING EXPERIMENT STATION.
Transpiration and Evaporation of Sewage Effluent,
W79-00088 5D

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The Isotope Hydrology of the Mereenie Sandstone Aquifer, Alice Springs, Northern Territory, Australia,
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W79-00481 3

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V79-00123 2B

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W79-00270 5A

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W79-00095 6E

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W79-00096 6G

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W79-00014 5A

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Solid State Event Recorder for Rainfall Measurement,
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The Closed Mill Concept,
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High Temperature Elctrodialysis-Phase VI,
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Waste Treatment for a Profit,
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Stamina Tunnel Tests on Hatchery-Reared Atlantic Salmon,
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Carbon Contact Column,
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Pipe Sizes from Modified Moody Diagram,
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Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation,
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Molecular Fractionation by Staged Ultrafiltration,
W79-00367 5D

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Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh,
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Apparatus for Deploying and Taking Up an Oil Fence,
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Nekoosa Cleans Condensates with Steam Distillation,
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Ion Selective Electrodes in Water Quality Analysis,
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Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
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Regional Geology Series: Part VII, The Colorado Plateau,
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Wetlands as a Naval Environmental Concern,
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Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,
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A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
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Numerical Study of Continuous Saltation,
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Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,
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A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales,
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Simple Sampler Activation and Recording System,
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Nature and Impact of Rural Stream Inputs on Water Quality,
W79-00483 5C

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
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Survival and Early Growth of Selected Trees on Waste Water Application Sites,
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Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,
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B. R. /Hanson ;I. A. /Schipper
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A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity,
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How Kind to the Resources is the Grindin Process. (Hvor ressursvennlig er slipeproses sen),
W79-00408 3

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Effects of Dissolved Oxygen in the Oxygena tion Activated Sludge Process,
W79-00351 5

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Process and System for Recovery of Energ from Geothermal Brines and Other Water Co taining Sources by Direct Contact with a Wor ing Fluid Below the Critical Pressure,
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W79-00305 5

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Clarifier With Suspended Layer of Sedime (Osvetlitel' so vzveshennym sloem osadka),
W79-00421 5

OHIO STATE UNIV., COLUMBUS. DEPT. OF GEOLOGY AND MINERALOGY.
Determination of Spoil-Bank Erosion Rates Ohio by Using Interbank Sediment Accumul tions,
W79-00495

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Inland Ice Sheet Thinning Due to Holocer Warmth,
W79-00340 2

OJI PAPER CO. LTD., (TOKYO) JAPAN.
The Radiation-Induced Degradation of Lign in Aqueous Solutions,
W79-00164 5

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO.
Deflection of P.V.C. Pipe Under Burial Cond tions,
W79-00103 8

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS.
Distributional Implications of the Extend Economic Zone: Some Policy and Research I sues in the Fishery: Discussion,
W79-00238

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Toxicity of the Fungicide Captan to the Dung ness Crab Cancer Magister,
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W79-00171 5

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Bedforms and Their Hydraulic Stability Relationships in a Tidal Environment, Bay of Fundy, Canada,
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Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,
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Data Base System for State Water Quality Management Information System.
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W79-00230 6G

A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania,
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W79-00127 2L

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W79-00458 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING.
Water/Energy Management and Evaluation Model for Pennsylvania,
W79-00007 6D

PERMUTIT CO., INC., PRINCETON, NJ. RESEARCH AND DEVELOPMENT CENTER.
Increased Product Water Recovery by Reverse Osmosis Using Interstage Ion Exchange Softing and a Spiractor,
W79-00301 3A

PETROLITE CORP., ST. LOUIS, MO.
Factors Influencing Induced Air Flotation,
W79-00375 5D

PETROLITE CORP., ST. LOUIS, MO. (ASSIGNEE).
Employing Methylene Phosphonates of Oxyalkylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,
W79-00052 5F

PETROLITE CORP., ST. LOUIS, MO. PETROLITE DIV.
Critical Analysis of Flotation Performance,
W79-00376 5D

PHILADELPHIA ELECTRIC COMPANY, PA.
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Station Wastewater Treatment System,
W79-00357 5D

PITTSBURG UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Three-Dimensional Open Channel Flow,
W79-00312 8B

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Stream Temperature Estimation Using Kalman Filter,
W79-00121 5B

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Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna of the Stream Rybi Potok (The High Tatra Mts),
W79-00221 5C

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W79-00220 5C

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Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
W79-00216 5C

Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
W79-00217 5C

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W79-00218 5C

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Controlling and Monitoring Activated-Sludge Units,
W79-00160 5D

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A New Finite Element Technique for the Solution of Two-Phase Flow Through Porous Media,
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Dynamic Programming and the Principle of Optimality: A Systematic Approach,
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Pollution of Groundwater Through Nonlinear Diffusion,
W79-00110 5B

PURDUE UNIV., LAFAYETTE, IN. AGRICULTURAL EXPERIMENT STATION.
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W79-00473 2G

PURDUE UNIV., LAFAYETTE, IN. SCHOOL OF CIVIL ENGINEERING.
Operating Model for the Green River Basin Reservoir System,
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Biological Effects and Environmental Aspects of 1,3-Butadiene,
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Continuous Simulation of Nonpoint Pollution,
W79-00493 5B

RESEARCH CORP. OF NEW ENGLAND, WETHERSFIELD, CT.
Sampling and Modeling of Non-Point Sources at a Coal-Fired Utility,
W79-00279 5B

Modeling and Monitoring of Toxic Spills and Toxic Effluents,
W79-00343 5B

Management Plan for Control and Treatment of Toxic Substances,
W79-00346 5G

Wastewater Odor Problem Solving -- Process Modification Versus Air Treatment,
W79-00373 5D

RESEARCH-COTTRELL, INC., BOUND BROOK, NJ.
Collecting Bark Burner Ash with Electrostatic Precipitators,
W79-00163 5D

RESEARCH COUNCIL OF ALBERTA, EDMONTON.
Hydrogeology of the Grande Prairie Area, Alberta,
W79-00470 2F

RESEARCH INST. OF FORESTS AND RANGELANDS, TEHRAN (IRAN).
Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00474 3B

Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00475 3B

RHODE ISLAND UNIV., KINGSTON, DEPT. OF RESOURCE ECONOMICS.
Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,
W79-00237 6E

RIDER COLL., TRENTON, NJ. DEPT. OF BIOLOGY.
Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),
W79-00214 5C

RIJKSINSTITUUT VOOR DRINKWATER-VOORZIENING, LEIDSCHENDAM (NETHERLANDS).
Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,
W79-00073 5A

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, FORT COLLINS, CO.
Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,
W79-00140 4C

ROHM AND HAAS CO., PHILADELPHIA, PA. (ASSIGNEE).
Desalination Process Using Thermally Regenerable Resins,
W79-00057 3A

ROHM AND HAAS KENTUCKY INC., LOUISVILLE, KY.
Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,
W79-00374 5D

ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT (NETHERLANDS).
A Simple Model for Shallow Lake Evaporation,
W79-00326 2D

SACHS-SYSTEMTECHNIK G.M.B.H., SCHWEINFURT (WEST GERMANY).
Battery Operated Water Purification System,
W79-00043 5F

SARATOV AGRICULTURAL INST. (USSR).
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00018 2I

SAVANNAH RIVER ECOLOGY LAB., AIKEN, SC.
Uptake of Americum-241 by Algae and Bacteria,
W79-00067 5B

SCIENCE AND EDUCATION ADMINISTRATION, TEMPLE, TX. GRASSLAND-FORAGE RESEARCH CENTER.
Seepage Control by Particle Size Selection,
W79-00484 4A

SCIENCE AND EDUCATION ADMINISTRATION, WASHINGTON, DC.
Soil, Water and Air Sciences Research.
W79-00105 2G

SCRIPPS INSTITUTION OF OCEANOGRAPHY, SAN DIEGO, CA. VISIBILITY LAB.
Optical Classification of Natural Waters,
W79-00318 2L

SERVICIO NACIONAL DE AGUAS SUBTERRANEOUS, SAN JOSE (COSTA RICA).
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,
W79-00311 2F

SEVERN-TRENT WATER AUTHORITY, BIRMINGHAM (ENGLAND).
Simulation of Flows in Ungaged Basins,
W79-00331 2E

SNAM PROGETTI S.P.A., MILAN (ITALY).
Method for Depolluting Fresh and Sea Water from Petrolcum Products,
W79-00058 5G

SOUTH AUSTRALIA DEPT. OF MINES, ADELAIDE.
A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Artesian Basin, Central Australia,
W79-00112 2F

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY; AND SOUTH CAROLINA UNIV., COLUMBIA. BELLE W. BARUCH INST. FOR MARINE BIOLOGY AND COASTAL RESEARCH.
Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,
W79-00488 2L

SOUTHERN ILLINOIS UNIV. AT CARBONDALE, IL. DEPT. OF BOTANY.
Our Reclamation Future: The Missing Bet on Trees,
W79-00086 4C

SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE, DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY.
Evaluation of Donnan Dialysis for the Enrichment of Cations,
W79-00434 5A

STANFORD RESEARCH INST., MENLO PARK, CA.
Research to Anticipate Environmental Impacts of Changing Resource Usage.
W79-00085 6G

STATE UNIV. OF NEW YORK AT ALBANY. ATMOSPHERIC SCIENCES RESEARCH CENTER.
Seven Problems in Bubble and Jet Drop Researchers,
W79-00319 8B

STATE UNIV. OF NEW YORK AT ALBANY. DEPT. OF ATMOSPHERIC SCIENCE.
Electric Rainfall Intensity Sensor,
W79-00329 2B

STATE UNIV. OF NEW YORK AT ALBANY. SCHOOL OF BUSINESS.
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Management,
W79-00243 6A

STATE UNIV. OF NEW YORK AT FREDONIA. ENVIRONMENTAL RESOURCES CENTER.
Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Organic Carbon in a Eutrophic Lake,
W79-00213 5C

STATE UNIV. OF NEW YORK AT SYRACUSE. COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY.
Effects of Municipal Sewage Effluent Irrigation on the Trace Metal Content of Earthworms,
W79-00009 5C

STONE AND WEBSTER ENGINEERING CORP., BOSTON, MA.
Design Considerations for Wastewater Treatment Systems at Existing Fossil Power Plants,
W79-00358 5D

SUMITOMO ELECTRIC INDUSTRIES LTD., OSAKA (JAPAN). (ASSIGNEE).
Method of Disposing of Waste Water Containing Emulsified Oil,
W79-00020 5D

TECHNICAL UNIV. OF ISTANBUL (TURKEY). DEPT. OF HYDRALIC AND WATER POWER.
Scour of Bed Material in Very Rough Channels,
W79-00122 2J

TECHNISCHE HOCHSCHULE, DARMSTADT (WEST GERMANY). INST FUER MAKROMOLEKULARE CHEMIE.
On the Removal of Lignosulfonates and Carbohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von Ligninsulfonaten und Kohlenhydraten aus Sulfitzellstoff-Waschwaessern mittels Aktivkohle),
W79-00410 5D

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). DEPT. OF CIVIL ENGINEERING; AND TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). LAB. OF FLUID MECHANICS.
Internal Fronts in Two-Layer Flo,
W79-00486 8B

TENCO HYDRO/AEROSCIENCES, INC., COUNTRYSIDE, IL. (ASSIGNEE).
Belt Type Oil Removal Unit,
W79-00040 5G

TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
A Comparative In Vitro Study of the Effects of Various Balanced Saline Solutions on Respiration Rates of Liver Tissues of Three Fish Species,
W79-00454 5C

TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE. DEPT. OF CIVIL ENGINEERING.
Development of a Manometric Fish Bioassay Technique for Water Pollution,
W79-00008 5A

TENNESSEE TECHNOLOGICAL UNIV., COOKVILLE. DEPT. OF BIOLOGY.
Artificial Substrate Sampler for Benthic Invertebrates in Ponds, Small Lakes, and Reservoirs,
W79-00074 7B

TENNESSEE UNIV., KNOXVILLE. DEPT. OF CIVIL ENGINEERING.
Stormwater Modeling,
W79-00381 5B

Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,
W79-00447 5G

Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knoxville, Tennessee,
W79-00456 5B

TENNESSEE VALLEY AUTHORITY, CHATTANOOGA.
Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00356 5D

ENNESSEE VALLEY AUTHORITY, HATTANOOGA. DIV. OF ENVIRONMENTAL LANNING.
Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
W79-00155 5D

ERECO CORP., COLLEGE STATION, TX. SSIGNEE).
Aquatic Biotal Monitor,
W79-00033 5A

EXAS A AND I UNIV., KINGSVILLE. DEPT. F CIVIL AND MECHANICAL ENGINEERING.
Water Well Development Decisions,
W79-00167 8B

EXAS A AND M UNIV., COLLEGE STATION. EPT. OF SOIL AND CROP SCIENCES.
Water Relations of Fritted Clays,
W79-00476 2G

EXAS A AND M UNIV., GALVESTON. DEPT. F MARINE SCIENCES.
The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,
W79-00063 5C

EXAS TECH UNIV., LUBBOCK. DEPT. OF ICROBIOLOGY.
A Method of Measuring Bacterial Growth in Aquatic Environments Using Dialysis Culture,
W79-00109 5A

EXAS TECH UNIV., LUBBOCK. DEPT. OF LANT AND SOIL SCIENCE.
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,
W79-00016 2I

Water Relations and Physiological Activity of Potatoes,
W79-00017 2I

EXAS UNIV. AT AUSTIN, PORT ARANSAS. ORT ARANSAS MARINE LAB.
The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
W79-00081 5C

HESSALONIKI UNIV., SALONIKA (GREECE). ACULTY OF TECHNOLOGY.
On the Two-Dimensional Groundwater Movement,
W79-00108 2F

IFLIS INST. OF FORESTRY (USSR).
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of Silvicultural Practices. (In Russian).
W79-00401 4C

OKYO UNIV., TOKYO (JAPAN).
Sludge Treatment by Supersonic Jet-Flame,
W79-00403 5E

ORO CO., SAN MARCOS, CA. (ASSIGNEE).
Angularity Sensor Means for Center Pivot Irrigation System,
W79-00023 3F

SENTRALNYI GOSUDARSTVENNYI AUCHNO-ISSLEDOVATELSKII INST. ZERNOGO I RECHNOGO RYBNOGO HOZYAISTVA, BAKU (USSR). AZERBAIJAN RANCH.
Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions (In Russian),
W79-00180 2H

ULSTER COLL. NORTHERN IRELAND POLYTECHNIC, JORDANSTOWN.
Momentum Transfer in a Compound Channel,
W79-00334 8B

UNION CARBIDE CORP., SISTERSVILLE, WV.
UNOX Wastewater Treatment System Performance Silicone Chemical Complex,
W79-00349 5D

UNION CARBIDE CORP., SOUTH CHARLESTON, WV.
The UNOX Process: Effective Wastewater Treatment Practice,
W79-00347 5D

UNIVERSAL OIL PRODUCTS, INC., SAINT PAUL, MN. JOHNSON DIV.
Water Usage Requires Planning,
W79-00183 6D

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. DEPT. OF INGENIERA.
Eddy Production Inside Wall Layers,
W79-00333 8B

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. INST. DI BIOLOGIA.
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
W79-00079 2L

UNIVERSITY OF MANCHESTER INST. OF SCIENCE AND TECHNOLOGY (ENGLAND). DEPT OF CIVIL AND STRUCTURAL ENGINEERING.
Pressure Fluctuations Beneath Submerged Jump,
W79-00316 8B

UNIVERSITY OF NEW ENGLAND, ARMIDALE (AUSTRALIA). DEPT. OF GEOGRAPHY.
Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,
W79-00113 2B

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove and Salt Marsh Estuary: A Comparative Study,
W79-00204 5C

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. COLL. OF BUSINESS ADMINISTRATION.
A Study of Coastal Pollution and Agency Interface,
W79-00389 5G

UNIVERSITY OF WEST FLORIDA, PENSACOLA. FACULTY OF BIOLOGY.
Toxicity of Sodium Pentachlorophenate (NA-PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,
W79-00078 5C

UPPSALA UNIV. (SWEDEN). INST. OF ZOOPHYSIOLOGY.
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemoura Cinerea (Plecoptera),
W79-00076 5G

UTAH STATE UNIV., LOGAN. DEPT. OF BIOLOGY.
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
W79-00297 2H

A Procaryotic Intracellular Symbiont of the Great Salt Lake Brine Shrimp Artemia Salina (L.),
W79-00298 2H

UTAH WATER RESEARCH LAB., LOGAN.
WASOPT Users Manual: An Integer Programming Methodology for Municipal/Regional Water Supply Planning,
W79-00002 6A

Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
W79-00145 3C

VALMET OY, JYVASKYLA (FINLAND).
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Determination Using Pb(2-) Ion Specific Electrode and Various measurement Methods,
W79-00429 5A

VERSAR, INC., SPRINGFIELD, VA.
A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the Environment,
W79-00289 5B

Assessment of the Environmental Impacts on the Ban on Imports of PCBs,
W79-00290 5G

VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY.
Water Administration in England and Wales Impacts of Reorganization,
W79-00384 6E

VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL, CHARLOTTESVILLE.
Water Reuse at Highway Rest Areas: Evaluation Phase,
W79-00087 5D

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY, BLACKSBURG, VA. AGRICULTURAL ENGINEERING DEPARTMENT.
A Model for Evaluating the Effect of Land Uses on Flood Flows,
W79-00450 4C

VYSKUMNY USTAV RASTLINNEJ VYROBY, PIESTANY (CZECHOSLOVAKIA).
Relationships Among Some Physical Properties of Soil (In Slovenian),
W79-00451 2G

WARSAW UNIV. (POLAND). DEPT. OF ENVIRONMENTAL MICROBIOLOGY.
The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Activated Sludge Microflora,
W79-00159 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF ZOOLOGY.
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River Canyon, Washington,
W79-00146 6G

WASHINGTON UNIV., SEATTLE.
The Development of the Electrical Power System in the Pacific Northwest. A Public Policy Perspective,
W79-00143 6E

Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources,
W79-00144 6E

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERS.
Climate Change: Detection and Its Impact on Hydrologic Design.
W79-00492 2E

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited Diatom Growth.
W79-00229 5C

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
Seasonal Changes in Respiratory Enzyme Activity and Productivity in Lake Washington Microplankton.
W79-00212 5C

WASTE RESEARCH UNIT, OXON (ENGLAND). HARWELL LAB.
Adsorption of Some Toxic Substances by Waste Components.
W79-00152 5B

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Textile Waste Waters: Treatment and Environmental Effects.
W79-00166 3E

WATERLOO UNIV. (ONTARIO). DEPT. OF GEOGRAPHY.
An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West Coast Fishery.
W79-00394 6E

WATERLOO UNIV. (ONTARIO). DEPT. OF SYSTEMS DESIGN.
A General Two Dimensional River Simulator.
W79-00397 2E

WEST VIRGINIA UNIV., MORGANTOWN.
Studies of Ion Exchange and Chelation Compounds Adsorbed on Granular Graphite.
W79-00431 5D

Continuous Electrochemical Synthesis Using a Packed Granular Electrode.
W79-00432 5D

Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling Filter.
W79-00433 5D

Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water.
W79-00444 5A

Aerobic Media Trickling Filter Applied to Nitrogen Control.
W79-00445 5D

A Study for Improving the Aerobic-Media Trickling Filter.
W79-00457 5D

WEST VIRGINIA UNIV., MORGANTOWN. DEPT. OF CHEMICAL ENGINEERING.
Total Phosphorus Transport During Storm Events.
W79-00478 5B

WESTERN ILLINOIS UNIV., MACOMB.
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for the Species.
W79-00413 5C

WEYERHAEUSER CO., SPRINGFIELD, OR.
Steam Stripping Reduce Condensate at Weyco Mill
W79-00409 3E

WISCONSIN UNIV.-MADISON. CENTER FOR RESOURCE POLICY STUDIES.
Property Rules, Liability Rules, and Environmental Economics.
W79-00241 6E

WISCONSIN UNIV.-MADISON, DEPT. OF AGRICULTURAL ECONOMICS.
Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery.
W79-00236 6E

WISCONSIN UNIV.-MADISON. DEPT. OF METEOROLOGY.
On Geostrophic Adjustment in Sea Straits and Wide Estuaries. Part I: One-Layer System.
W79-00131 2L

WISCONSIN UNIV.-MADISON. DEPT. OF METEOROLOGY; AND WISCONSIN UNIV.-MADISON. MARINE STUDIES CENTER.
On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Experiments. Part II - Two-Layer System.
W79-00497 2L

WISCONSIN UNIV.-MADISON. DEPT. OF SOIL SCIENCE.
Steady Infiltration from Single and Periodic Strip Sources.
W79-00471 2G

WOLLONGONG UNIV. (AUSTRALIA). DEPT. OF CHEMISTRY.
Recovery of Tin from Electroplating Solutions and Rinse Waters.
W79-00157 5D

WOOD (WILLIAM S.) AND ASSOCIATES, WEST CHESTER, PA.
Safety Aspects of Toxic and Hazardous Spills.
W79-00345 5G

WOODBINE CORP., FORT WORTH, TX. (ASSIGNEE).
Stabilization of Earth Subsurface Layers.
W79-00035 8D

YAROSLAVSKII GOSUDARSTVENNYI PEDAGOGICHESKII INST. (USSR).
Effect of Environmental Factors on the Distribution of Caddis Fly Larvae in Small Rivers (In Russian).
W79-00147 2I

ACCESSION NUMBER INDEX

W79-00001 5C
W79-00002 6A
W79-00003 5A
W79-00004 5B
W79-00005 5B
W79-00006 5B
W79-00007 6D
W79-00008 5A
W79-00009 5C
W79-00010 6B
W79-00011 5C
W79-00012 7B
W79-00013 5A
W79-00014 5A
W79-00015 3A
W79-00016 2I
W79-00017 2I
W79-00018 2I
W79-00019 5F
W79-00020 5D
W79-00021 5G
W79-00022 5D
W79-00023 3F
W79-00024 5D
W79-00025 5G
W79-00026 5D
W79-00027 5F
W79-00028 5D
W79-00029 5G
W79-00030 5D
W79-00031 3F
W79-00032 3F
W79-00033 5A
W79-00034 5G
W79-00035 8D
W79-00036 5G
W79-00037 4B
W79-00038 3F
W79-00039 5F
W79-00040 5G
W79-00041 5D
W79-00042 5D
W79-00043 5F
W79-00044 5D
W79-00045 5F
W79-00046 5F
W79-00047 7B
W79-00048 5G
W79-00049 4B
W79-00050 5G
W79-00051 5A
W79-00052 5F
W79-00053 5D
W79-00054 5F
W79-00055 5D
W79-00056 5D
W79-00057 3A
W79-00058 5G
W79-00059 3F
W79-00060 2G
W79-00061 5B
W79-00062 5C
W79-00063 5C
W79-00064 5C
W79-00065 5C
W79-00066 5B
W79-00067 5B
W79-00068 5C
W79-00069 7B
W79-00070 7B
W79-00071 7B
W79-00072 7B
W79-00073 5A
W79-00074 7B
W79-00075 8I
W79-00076 5G
W79-00077 5B
W79-00078 5C
W79-00079 2L
W79-00080 5A
W79-00081 5C
W79-00082 5C
W79-00083 5C
W79-00084 5G
W79-00085 6G
W79-00086 4C
W79-00087 5D
W79-00088 5D
W79-00089 2B
W79-00090 2C
W79-00091 8G
W79-00092 3A
W79-00093 6B
W79-00094 6E
W79-00095 6E
W79-00096 6G
W79-00097 6B
W79-00098 6E
W79-00099 7B
W79-00100 5C
W79-00101 10F
W79-00102 5D
W79-00103 8D
W79-00104 6D
W79-00105 2G
W79-00106 10C
W79-00107 4B
W79-00108 2F
W79-00109 5A
W79-00110 5B
W79-00111 2F
W79-00112 2F
W79-00113 2B
W79-00114 2G
W79-00115 2E
W79-00116 2E
W79-00117 2J
W79-00118 5G
W79-00119 4A
W79-00120 2C
W79-00121 5B
W79-00122 2J
W79-00123 2B
W79-00124 2E
W79-00125 2B
W79-00126 2B
W79-00127 2L
W79-00128 2H
W79-00129 2L
W79-00130 2L
W79-00131 2L
W79-00132 2H
W79-00133 2L
W79-00134 2F
W79-00135 2F
W79-00136 2F
W79-00137 6A
W79-00138 5A
W79-00139 7B
W79-00140 4C
W79-00141 2J
W79-00142 6B
W79-00143 6E
W79-00144 6E
W79-00145 3C
W79-00146 6G
W79-00147 2I
W79-00148 5C
W79-00149 2I
W79-00150 5C
W79-00151 5G
W79-00152 5B
W79-00153 5D
W79-00154 5D
W79-00155 5D
W79-00156 5C
W79-00157 5D
W79-00158 5G
W79-00159 5D
W79-00160 5D
W79-00161 5D
W79-00162 5D
W79-00163 5D
W79-00164 5D
W79-00165 5D
W79-00166 3E
W79-00167 8B
W79-00168 8G
W79-00169 5B
W79-00170 4B
W79-00171 5C
W79-00172 5G
W79-00173 8C
W79-00174 8C
W79-00175 8B
W79-00176 5F
W79-00177 8B
W79-00178 8C
W79-00179 5F
W79-00180 2H
W79-00181 8B
W79-00182 8C
W79-00183 6D
W79-00184 3F
W79-00185 8G
W79-00186 8G
W79-00187 2I
W79-00188 5B
W79-00189 5B
W79-00190 5B
W79-00191 3F
W79-00192 3F
W79-00193 3F
W79-00194 3F
W79-00195 4C
W79-00196 2I
W79-00197 4A
W79-00198 2I
W79-00199 2G
W79-00200 2I
W79-00201 6G
W79-00202 2I
W79-00203 2G
W79-00204 5C
W79-00205 5C
W79-00206 5C
W79-00207 4A
W79-00208 5C
W79-00209 5C
W79-00210 5C
W79-00211 5C
W79-00212 5C
W79-00213 5C
W79-00214 5C
W79-00215 5C
W79-00216 5C
W79-00217 5C
W79-00218 5C
W79-00219 5C
W79-00220 5C
W79-00221 5C
W79-00222 5G
W79-00223 5A
W79-00224 7B
W79-00225 5A
W79-00226 5G
W79-00227 5A
W79-00228 5D
W79-00229 5C
W79-00230 6G
W79-00231 6B
W79-00232 6G
W79-00233 5G
W79-00234 6B
W79-00235 6E
W79-00236 6E
W79-00237 6E
W79-00238 6E
W79-00239 6C
W79-00240 6E
W79-00241 6E
W79-00242 6B
W79-00243 6A
W79-00244 6C
W79-00245 5G
W79-00246 5G
W79-00247 2D
W79-00248 5G
W79-00249 5B
W79-00250 5A
W79-00251 7C
W79-00252 7C
W79-00253 7C
W79-00254 5B
W79-00255 7C
W79-00256 5B
W79-00257 2E
W79-00258 2E
W79-00259 7C
W79-00260 4B
W79-00261 5A
W79-00262 2E
W79-00263 2E
W79-00264 2H
W79-00265 7C
W79-00266 7C
W79-00267 7C
W79-00268 7C
W79-00269 2G
W79-00270 5A
W79-00271 5B
W79-00272 4A
W79-00273 2E
W79-00274 4B
W79-00275 7C
W79-00276 5A
W79-00277 7C
W79-00278 5C
W79-00279 5B
W79-00280 5F
W79-00281 5A
W79-00282 5A
W79-00283 5A
W79-00284 2G
W79-00285 5A
W79-00286 5A
W79-00287 5A
W79-00288 2I
W79-00289 5B
W79-00290 5G
W79-00291 5B
W79-00292 5C
W79-00293 5C
W79-00294 5C
W79-00295 2L
W79-00296 3F
W79-00297 2H
W79-00298 2H
W79-00299 5A
W79-00300 3A
W79-00301 3A
W79-00302 3A
W79-00303 3A
W79-00304 3A
W79-00305 5A
W79-00306 5D
W79-00307 3F
W79-00308 5B
W79-00309 5B
W79-00310 2G
W79-00311 2F
W79-00312 8B

W79-00313 8A
W79-00314 8B
W79-00315 8B
W79-00316 8B
W79-00317 5C
W79-00318 2L
W79-00319 8B
W79-00320 2H
W79-00321 5A
W79-00322 2F
W79-00323 2F
W79-00324 2L
W79-00325 5A
W79-00326 2D
W79-00327 2B
W79-00328 2B
W79-00329 2B
W79-00330 2F
W79-00331 2L
W79-00332 5B
W79-00333 8B
W79-00334 8B
W79-00335 3I
W79-00336 2L
W79-00337 5G
W79-00338 2L
W79-00339 5A
W79-00340 2C
W79-00341 8B
W79-00342 5D
W79-00343 5B
W79-00344 5C
W79-00345 5G
W79-00346 5G
W79-00347 5D
W79-00348 5D
W79-00349 5D
W79-00350 5D
W79-00351 5D
W79-00352 5D
W79-00353 5D
W79-00354 5D
W79-00355 5D
W79-00356 5D
W79-00357 5D
W79-00358 5D
W79-00359 5D
W79-00360 5D
W79-00361 5L
W79-00362 5I
W79-00363 5I
W79-00364 5D
W79-00365 5D
W79-00366 5D
W79-00367 5D
W79-00368 5D
W79-00369 5D
W79-00370 5D
W79-00371 5D
W79-00372 5I
W79-00373 5D
W79-00374 5D
W79-00375 5D
W79-00376 5D
W79-00377 5D
W79-00378 5D
W79-00379 5B
W79-00380 8B
W79-00381 5B
W79-00382 2K
W79-00383 6I
W79-00384 6I
W79-00385 5A
W79-00386 4B
W79-00387 5I
W79-00388 4C
W79-00389 5G
W79-00390 4A
W79-00391 5B
W79-00392 4A
W79-00393 4A
W79-00394 6F
W79-00395 2G
W79-00396 6A
W79-00397 2E
W79-00398 5B
W79-00399 5D
W79-00400 3E
W79-00401 4C
W79-00402 5D
W79-00403 5L
W79-00404 5D
W79-00405 5A
W79-00406 5C
W79-00407 5C
W79-00408 3E
W79-00409 3E
W79-00410 5D
W79-00411 3E
W79-00412 5D
W79-00413 5C
W79-00414 5D
W79-00415 5A
W79-00416 5D
W79-00417 5A
W79-00418 3E
W79-00419 5D
W79-00420 3E
W79-00421 5D
W79-00422 5E
W79-00423 5A
W79-00424 5D
W79-00425 5E
W79-00426 5C
W79-00427 5C
W79-00428 8I
W79-00429 5A
W79-00430 6F
W79-00431 5D
W79-00432 5D
W79-00433 5D
W79-00434 5A
W79-00435 5B
W79-00436 1B
W79-00437 5A
W79-00438 6A
W79-00439 4A
W79-00440 3D
W79-00441 2L
W79-00442 8A
W79-00443 5C
W79-00444 5A
W79-00445 5D
W79-00446 5I
W79-00447 5G
W79-00448 5B
W79-00449 6B
W79-00450 4C
W79-00451 2G
W79-00452 4A
W79-00453 6D
W79-00454 5C
W79-00455 5G
W79-00456 5B
W79-00457 5D
W79-00458 5C
W79-00459 5B
W79-00460 4C
W79-00461 5A
W79-00462 2J
W79-00463 5C
W79-00464 7B
W79-00465 5D
W79-00466 8D
W79-00467 8D
W79-00468 2B
W79-00469 8B
W79-00470 2I
W79-00471 2G
W79-00472 2G
W79-00473 2G
W79-00474 3B
W79-00475 3B
W79-00476 2G
W79-00477 2E
W79-00478 5B
W79-00479 5B
W79-00480 7B
W79-00481 3F
W79-00482 4A
W79-00483 5C
W79-00484 4A
W79-00485 8B
W79-00486 8B
W79-00487 2I
W79-00488 2I
W79-00489 5B
W79-00490 2J
W79-00491 2A
W79-00492 2L
W79-00493 5B
W79-00494 2L
W79-00495 2J
W79-00496 8D
W79-00497 2L
W79-00498 2G
W79-00499 3F
W79-00500 2G

ABSTRACT SOURCES

OURCE	ACCESSION NUMBER	TOTAL
. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-00498--00500	3
Cornell University, Policy Models for Water Resources Systems	W79-00188--00190 00379--00381 00383--00384 00386--00394 00396--00398	20
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-00151--00166	16
Illinois State Water Survey, Hydrology	W79-00107--00141 00308--00319 00321--00341 00463--00497	103
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W79-00399--00400 00402--00422 00424--00430	30
National Water Well Association, Water Well Construction Technology	W79-00167--00179 00181--00186	19
University of North Carolina, Metropolitan Water Resources Planning and Management	W79-00191--00194	4
University of Wisconsin, Eutrophication	W79-00204--00206 00208--00221 00229	18
University of Wisconsin, Water Resources Economics	W79-00230--00246	17
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-00002--00015 00142--00146 00148--00150 00296--00299 00431--00437 00439--00461	56

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service	W79-00018, 00060 00079, 00147 00180, 00187 00199--00200 00203, 00207 00247, 00269 00280, 00284 00288, 00295 00320, 00382 00385, 00395 00401, 00423 00462	23
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-00061--00078 00080--00083 00276--00279 00281--00283 00285--00287 00289--00294	38
Information Planning Associates, Inc.	W79-00084--00106 00222--00228 00342--00378	67
Ocean Engineering Information Service (Patents)	W79-00019--00059	41
Office of Water Research and Technology	W79-00001 00016--00017 00300--00307 00438	12
U. S. Geological Survey	W79-00251--00268 00270--00275	24
University of Massachusetts (Wetlands)	W79-00195--00198 00201--00202	6

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

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A12	10.75	E12	25.00	T12	650.00
A13	11.00	E13	28.00	T13	675.00
A14	11.75	E14	31.00	T14	750.00
A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
A17	13.00	E17	40.00	T17	900.00
A18	13.25	E18	45.00	T18	950.00
A19	14.00	E19	50.00	T19	1.000.00
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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 2
JANUARY 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 2
JANUARY 15, 1979

W79-00501 -- W79-01000

he Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the ransaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

SECOND ROW MOLECULAR ORBITAL CALCULATIONS MINIMAL AND MINIMAL +3D BASIS CALCULATIONS ON SECOND ROW DIATOMICS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
F. J. Marsh, and M. S. Gordon.
Chemical Physics Letters. Vol. 45, No. 2, p 255-260, January 15, 1977. 5 tab, 24 ref. OWRT A-045-NDAK(1), 14-34-0001-6035.

Descriptors: *Mathematical models, *Molecular structure, Equilibrium, *Diatomic molecules, *Diapole moments, Bond length(Atoms).

The optimal valence orbital exponents of a series of 24 diatomic molecules containing second row atoms are determined, with and without 3d orbitals in the basis set. Equilibrium bond lengths and dipole moments are calculated using Slater exponents as well as the optimal values. Optimization of valence s and p exponents is as important as the addition of d orbitals to the basis set for bond length predictions. Separate optimization of d exponents does not significantly improve calculated bond lengths. The computed dipole moments are less satisfactory for all basis sets, although the optimal exponent basis including d orbitals are in best overall agreement with experiment.
W79-00681

DENSITY MAXIMA IN HIGH-PRESSURE SUPERCOOLED WATER AND LIQUID SILICON DIXOIDE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
C. A. Angell, and H. Kanno.
Science, Vol. 193, p 1121-1122, September 1976, 2 fig, 16 ref. OWRT B-051-IND(10).

Descriptors: *Supercooling, *High pressure, *Nucleation, Deuterium, Crystallization, Physical properties, Density, Thermal properties, *Temperature of Maximum Density, *Nucleation temperature.

With glass capillary pressure vessels it has been possible to study the effect of pressure on the temperature of maximum density (TMD) and on the 'sharpness' of the density maximum in liquid H2O and D2O in the important but little-studied supercooled regime. A pressure of 1200 bars produces a 33 degree C depression of the TMD in these liquids and a considerable reduction in sharpness. Comparison with the rather flat density maximum for liquid SiO2 supports the notion that the presence or absence of density anomalies in 'tetrahedral' liquids depends on the average bridge-pond angle, which is evidently unusually large in water at normal pressure.
W79-00864

ISOTHERMAL COMPRESSIBILITY OF SUPERCOOLED WATER AND EVIDENCE FOR A THERMODYNAMIC SINGULARITY AT -45 DEGREES C,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
R. J. Speedy, and C. A. Angell.
The Journal of Chemical Physics, Vol. 65, No. 3, p 851-858, August 1976, 5 fig, 1 tab, 32 ref. OWRT B-051-IND(9).

Descriptors: *Supercooling, *Compressibility, Hydrogen bonding, Water properties, *Supercooled water, *Isothermal compressibility.

Using a capillary technique for small samples, the isothermal compressibility kappa tau of water has been measured to -26 degrees C. Accelerating increases of kappa tau at the lower temperatures can be described by an expression of the form kappa tau = alpha episilon gamma (where episilon = (T - Ts)/Ts), which is known to describe anomalies encountered in the vicinity of a thermodynamic singularity located at Ts. The implications that the thermodynamic and certain other properties of water at lower temperatures may be decomposed into a normal component and an anomalous component which diverges at Ts = -45 degrees C is supported by analysis of numerous other thermodynamic and relaxation data which extend into the supercooled regime. The anomalous characteristics are shown to originate primarily in the sensitivity of the volume to temperature changes, suggesting a geometrical basis for the cooperative behavior. The singularity at Ts = -45 degrees C may be a lambda transition associated with the cooperative formation of an open hydrogen-bonded network, but the near coincidence of Ts with the experimental homogeneous nucleation temperature suggests, as an alternative, that Ts may correspond to the limit of mechanical stability for the supercooled liquid phase.
W79-00866

2. WATER CYCLE

2A. General

DEVELOPMENT OF COMPUTER PROGRAM FOR LINEARIZED SUBHYDROGRAPHS METHOD FOR URBAN RUNOFF DETERMINATION,
Akron Univ., OH. Dept. of Civil Engineering.
S. Sarikelle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 300, Price codes: A08 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Completion Report, November 1977. 148 p, OWRT A-052-OHIO(1).

Descriptors: *Hydrologic models, *Runoff, *Surface runoff, *Computer models, *Storm runoff, Hydraulics, Hydrology, *Stormwater management, *Hydrograph simulation, Urban drainage.

A model for the simulation of urban runoff based on Linearized Subhydrographs Method of Urban Runoff Determination is developed for the planning and analysis of converging stormwater drainage systems in small and large urban areas. The model simulates hydrographs for both continuously recorded rainstorm events and synthetic design hyetographs. The model is applied to various urban watersheds with differing land use characteristics utilizing recorded hyetographs. The simulated hydrographs are then compared to recorded hydrographs. The results indicate that when single event hyetographs are utilized, the simulated hydrographs for both the inlet and pipe conditions compare well to those results obtained from measured values. The model structure and input requirements needed for the utilization of the program are presented. The limitations of the model are examined, and future research to improve this method is included.
W79-00526

MODELING OF HYDRAULIC SYSTEMS BY FINITE-ELEMENT METHODS,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. T. Cheng.
In: Advances in Hydroscience, Vol 11, Academic Press Inc., New York, p 207-284, 1978. 25 fig, 2 tab, 121 ref.

Descriptors: *Model studies, *Hydraulic systems, *Finite element analysis, *Numerical analysis, Groundwater movement, Lakes, Waves(Water), Evaluation, *Rayleigh-Ritz method, *Galerkin procedures.

The state of the art of the finite-element technique is reviewed. Both the Rayleigh-Ritz and Galerkin procedures are discussed in detail and their equivalences and differences are shown. Emphasis is placed on the finite-element modeling and solution techniques when applied to hydrologic systems. Using examples of subsurface and surface hydrologic problems, the principles, techniques and applications of the finite-element methods are demonstrated. (Woodard-USGS)
W79-00634

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. Krzysztofowicz, and M. H. Diskin.
Journal of Hydrology, Vol. 37, 1978, p 261-294. 7 tab, 12 fig, 15 ref.

Descriptors: *Model studies, *Hydrographs, *Rainfall-runoff relationships, Storms, Simulation analysis structural models, Analytical techniques, Climatic data, Theoretical analysis, Depth-area-duration analysis.

A model is presented in which a total hydrograph is derived from a single storm. The model is formulated upon two principles: (1) a single lumped input system is impractical when representing a storm which contains variability of rainfall. Consequently, it is necessary to divide the area into smaller zones of uniform rainfall input. (2) Since total rainfall input is divided into surface runoff, base flow runoff and losses based upon the moisture content of the upper soil layer, accounting procedures must be incorporated into the model. Procedures for identifying model parameters are demonstrated using the Raba River in Southern Poland. Calibration results and sensitivity analysis demonstrate the usefulness of the model. Because of this model's ability to account for rainfall variability it should be particularly valuable in the arid regions of the world where rainfall variation is characteristic. (Tickes-Arizona)
W79-00813

DIURNAL STRATIFICATION OF DEEP WATER IMPOUNDMENTS,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W79-00874

GALERKIN METHOD FOR A NON-LINEAR PARABOLIC EQUATION WITH MIXED NON-LINEAR BOUNDARY CONDITIONS,
California Univ., Santa Barbara. Coll. of Engineering.
For primary bibliographic entry see Field 2G.
W79-00900

2B. Precipitation

HYDROLOGY, FULTON COUNTY, NEW YORK,
Fulton County Planning Dept. Johnstown, NY.
For primary bibliographic entry see Field 4A.
W79-00663

AVAILABILITY OF ATMOSPHERIC WATER,
Rhodesia Dept. of Meteorological Service, Salisbury.
J. D. Torrance.
Transactions of the Rhodesian Scientific Association, Vol. 56, No. 2, p 31-45, 1975. 6 fig, 6 tab, 1 ref.

Descriptors: *Rainfall, *Moisture content, *Atmosphere, *Model studies, Mathematical models, Computer models, Precipitation(Atmospheric), Cloud physics, Cloud seeding, Weather modification, Meteorology, *Rhodesia.

A study was undertaken to investigate the relationships between atmospheric moisture and rainfall. It was found that: (1) there is a rather small interseasonal variation in totals of precipitable water, compared with the corresponding variation in rainfall; (2) there is a good agreement between interseasonal totals of precipitable water on raindays only, and rainfall totals; (3) there is good agreement between precipitable water and rainfall index; (4) on daily values, there is a general increase in the amount of rain as the precipitable water total increases; but dry days can still occur with any value of precipitable water; (5) high values of precipitable water are then a necessary, but not by themselves sufficient, condition for conversion of atmospheric moisture into rainfall. Computer modeling was used to show that the quantity of water vapor used by a thunderstorm is comparable with that held by the atmosphere per unit area. It was shown that even periods of heavy widespread rain do not deplete the reserves of moisture held in the atmosphere excessively, and it was clear that cloud-seeding activities are not likely to utilize more than a small proportion of the water vapor available in the air. There need be no concern that cloud seeding will deprive any area of its rightful share of the atmospheric moisture. (Sims-ISWS)
W79-00685

PROBABILITY ESTIMATE OF SNOW-COVER DEPTH DISTRIBUTION,
For primary bibliographic entry see Field 2C.
W79-00705

HARVEST DATES IN ANCIENT MESOPOTAMIA AS POSSIBLE INDICATORS OF CLIMATIC VARIATIONS,
Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
J. Neumann, and R. M. Sigrist.
Climatic Change, Vol. 1, No. 3, p 239-256, 1978. 2 tab, 2 fig, 52 ref.

Descriptors: *Paleoclimatology, *Bioindicators, *Paleohydrology, *Climatology, Arid climates, History, Meteorological data, Regional analysis, Agroclimatology, Crop response, Harvesting, Seasonal, Near East, Rainfall, Weather patterns.

Climatic development and change in the Near East including Mesopotamia since 2500 B.C. was first studied by Butzer in 1958 and has been the subject of several more recent studies. The basis for these studies is that in mediterranean type climate such as that in the Near East a negative correlation can be made between winter temperatures and seasonal rainfall. Many of these studies have agreed upon the speculation that a period of increased aridity began in this area about 2500 B.C. and was followed by a period of higher rainfall beginning about 850 B.C. The purpose of this study was to check these speculations based upon the examination of clay tablet inscriptions from ancient Babylonia that provided information about the dates of Barley harvest for two perods: 1800 B.C. to 1625 B.C. and 600-400 B.C. These tablets tell us that in the earlier period, harvest began late in March or early in April, while in the latter period it began late in April or in May, a Significant difference of a month or more. Presently, harvests in the Near East begin in the second half of April. These differences, too large to be caused by varietal change, support the speculation that the earlier period experienced a warmer more dry climate and the later period a cooler and more humid climate that is present today. (Tickes-Arizona)
W79-00816

A FLASH FLOOD AID - THE LIMITED AREA QPF,
National Weather Service, Fort Worth, TX. Southern Region.
J. Belville, G. A. Johnson, and J. D. Ward.
NOAA Technical Memorandum NWS SR-97, March 1978. 13 p, 2 fig, 3 tab, 21 ref, append.

Descriptors: *Flood forecasting, *Forecasting, *Rainfall, *Flash floods, *Texas, Quantitative Precipitation Forecast(QPF).

The Quantitative precipitation Forecast (QPF) shows the areal distribution and the amount of rainfall expected to occur over agiven period of tie. The most important facet of the QLPF is that it alerts the forecasters to the potential for excessive rains. The WSFO Lubbock QLPF procedures were developed primarily to indicate the maximum amount of precipitation expected within an area. Parameters investigated were climatology, certain 500 mb flow patterns, and five atmospheric variables which had been found t correlate well with episodes of heavy rain. These variables were lifted index, K-index, mean relative humidity (surface to 500 mb), tropopause temperatures, and precipitable water. Other variables, such as surface dew points and windsa aloft, may be incorporated into the program in the future; but the program should be kept simple and relatively easy for the forecasters to use.(NOAA)
W79-00994

2C. Snow, Ice, and Frost

DEVELOPMENT OF AN OPERATIONAL NORTHERN AQUATIC ECOSYSTEM MODEL,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W79-00513

EFFECTS OF PERMAFROST ON STREAM CHANNEL BEHAVIOR IN ARCTIC ALASKA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
K. M. Scott.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.20. Professional Paper 1068, 1978. 19 p, 11 fig, 2 tab, 38 ref.

Descriptors: *Channel erosion, *Scour, *Permafrost, *Ice breakup, *Alaska, Streams, Drainage area, Floods, *Arctic Coastal Plain.

Sites with drainage areas ranging from 88 to 12,200 sq km were monitored on five streams in northern Alaska during the breakup in 1976 to determine (1) the effects of frozen bed and bank material on channel behavior, and (2) the importance of the annual breakup flood in forming the channels of arctic streams. The thawing and concomitant erosion of channels varied with changes in bed-material size, channel pattern, drainage area, and climate. The response of channels to breakup flooding ranged from total permafrost control of channel processes, including both bed scour and lateral erosion, to only brief restriction of channel behavior early in the rise of the flooding. The watershed characteristic that appears to explain much of this variation is size of drainage area. (Woodard-USGS)
W79-00623

THERMAL STRESS NEAR THE SURFACE OF A GLACIER,
British Antarctic Survey, Cambridge (England).
Journal of Glaciology, Vol. 20, No. 83, p 257-283, 1978. 15 fig, 1 tab, 47 ref.

Descriptors: *Glaciers, *Ice, *Thermal stress, *Model studies, Temperature, Theoretical analysis, Analytical techniques, Cracks, Analysis, Thermal expansion, On-site data collections, Mathematical models, Stress analysis, Strain, Firn, Snow, *Barnes Ice Cap.

Stresses occur in the uppermost 10 m of a glacier as a result of temperature fluctuations at the surface. A model was set up of a typical year's surface temperature variation, and the progress of temperature waves through the glacier was calculated using Fourier theory of heat conduction. Short-period fluctuations are attenuated rapidly, and at 10 m depth the annual cycle is reduced to 5% of its surface amplitude. As the temperature of the ice varies, it undergoes small volume changes; stresses were calculated on the assumption that any tendency of the ice to expand or contract laterally results in the creation of just enough stress to cause the ice to remain unstrained. It was found that in the top 2 or 3 m, stresses of thermal origin are generally in excess of those due to gross deformation or overburden pressure. For the case of high-density ice, Glen's flow law was used, and conditions were found to be favorable for the formation of surface rumples of wavelength about 10 m. For the case of firn or snow, a Newtonian flow law was assumed, and it was found that under cold conditions, fracture under tension can occur. Cracks of thermal origin may be responsible for the initial formation of crevasses, and they also provide an explanation for background noise encountered when seismic shooting at low temperatures. Calculations were made of the strain-rate field surrounding a crack, and it was found that thermal effects can lead to appreciable strain-rate anomalies for strain-rate measurements near cracks. The magnitude of the effect is easily sufficient to account for anomalous fluctuating strain-rates found when using wire strainmeters on the Barnes Ice Cap. (Humphreys-ISWS)
W79-00686

ORIGIN OF FOLIATION IN GLACIERS,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
R. L. Hooke, and P. J. Hudleston.
Journal of Glaciology, Vol. 20, No. 83, p 285-299, 1978. 4 fig, 45 ref. NSF GA-42728, EAR 74-12293-A02.

Descriptors: *Glaciers, *Glaciology, *Structural behavior, Ice, Model studies, Movement, Leaves, Homogeneity, Physical properties, Theoretical analysis, Mathematical models, Bubbles, Structural analysis, Distribution patterns, Spatial distribution, *Foliation.

Laboratory studies suggested that neither bubbles nor dirt particles migrate rapidly enough in glacier ice to be responsible for the alternating layers of bubbly and clear ice or dirty and clean ice which constitute foliation. It was suggested that these variations in bubble or dirt content are inherited from primary inhomogeneities such as may occur in sedimentary stratification in the accumulation region, in crevasse fillings, or during debris entrainment at the base of the glacier: the appearance of these inhomogeneities is later modified by strain during flow to produce foliation. The authors considered 6 types of inhomogeneity, or components of foliation, and they showed that, at the very large total strains expected in glaciers, all are eventually flattened, stretched out, and rotated to form a layered structure roughly perpendicular to the direction of maximum total shortening. Most characteristics of observed foliation can be explained by this hypothesis. For example, in the marginal zones of polar ice sheets, the rapid decrease in dip of foliation with depth and with distance up-glacier from the margin can be explained by a model in which the foliation is assumed to be nearly parallel to the base of the glacier some distance from the margin and is deformed passively with the ice thereafter. However, some observations of cross-cutting foliations may require localized inhomogeneous shear parallel to the 'new' foliation. (Humphreys-ISWS)
W79-00687

SURFACE MASS-BALANCE VARIABILITY NEAR 'BYRD' STATION, ANTARCTICA, AND

ITS IMPORTANCE TO ICE CORE STRATIGRAPHY,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy; and Ohio State Univ., Columbus. Inst. of Polar Studies.
I. M. Whillans.
Journal of Glaciology, Vol 20, No 83, p 301-310, 1978. 5 fig, 22 ref.

Descriptors: *Ice, *Antarctic, *Surfaces, *Stratigraphy, Snowpacks, Movement, Analysis, On-site tests, Variability, Analytical techniques, Oxygen isotopes, Glaciology, *Byrd Station(Antarctica), Mass balance.

The local variability in surface mass balance (net snow accumulation) up-glacier from 'Byrd' station, Antarctica, is due to the combined effects of year-to-year 'climate' variations and of the surface microrelief due to snow drifts and sastrugi. These variabilities are consistent with the variability in surface mass balance obtained from core stratigraphy. The variabilities were used in a discussion of the difficulties encountered with the deep 'Byrd' station core in detecting annual layering by the stable oxygen-isotope ratio and the microparticle concentration techniques. The recognition of annual layers by these techniques requires that the snows of certain seasons be present in the measured section; but near 'Byrd' station, the microrelief is such that summer snow layers are not horizontally continuous and may be absent from a given section. At other sites on ice sheets, where the microrelief is less (less wind activity) or where the surface mass balance is larger, or both, less difficulty is anticipated in using the stable oxygen-isotope ratio and microparticle-concentration techniques to identify annual layers. (Humphreys-ISWS)
W79-00688

THE SPATIAL DISTRIBUTION OF 10 M TEMPERATURES IN THE ANTARCTIC PENINSULA,
British Antarctic Survey, Cambridge (England).
P. J. Martin, and D. A. Peel.
Journal of Glaciology, Vol 20, No 83, p 311-317, 1978. 3 fig, 1 tab, 19 ref.

Descriptors: *Ice, *Antarctic, *Glaciers, *Temperature distribution, Temperature, Spatial distribution, Boreholes, Data collections, Air temperature, Correlation analysis, Climatic data, Air temperature.

Temperatures from 10 m bore holes were analyzed to determine the spatial variation of mean annual surface temperature over the Antarctic Peninsula. In general, there is a decrease in temperature of 0.84 deg per degree latitude southwards combined with an altitude lapse rate of 0.68 deg per 100 m. There is a sharp divide between the continental type climate of the east coast and a maritime climate of the central and western regions. Temperatures are approximately 7 deg lower along the east coast compared with those at sites of a similar altitude and latitude on the west. (Humphreys-ISWS)
W79-00689

ORIGIN OF THE BASAL ICE LAYER FROM ALPINE GLACIERS INDICATED BY ITS CHEMISTRY,
Brussels Univ. (Belgium). Lab. de Geomorphologie.
R. A. Souchez, and R. D. Lorrain.
Journal of Glaciology, Vol 20, No 83, p 319-328, 1978. 4 fig, 3 tab, 20 ref.

Descriptors: *Glaciers, *Ice, *Glaciology, *Geochemistry, Alpine, Calcium, Lead, Sodium, Potassium, Magnesium, Chemical analysis, On-site data collections, Sampling, Cations, Lead radioisotopes, Stratigraphy, Foreign countries, Foreign research, *Switzerland, *Glacier de Tsanfleuron(Switzerland), *Glacier d'Argentiere'(Switzerland), Basal ice.

The basal ice layer of Alpine glaciers, the thickness of which can reach more than 1 m, generally appears as a sequence composed of layers of bubble-poor ice 0.5-3 cm thick and dirt layers containing dispersed rock fragments. Locally, debris-free bubbly ice is also present in the sequence. This basal layer exists on the lee side of rock protuberances or along the marginal part of the glacier. Three geochemical characteristics shed some light on its origin: (1) The high calcium content of basal ice sliding over limestones from the north side of Glacier de Tsanfleuron can be predicted successfully from considerations of the phase relations in regelating subglacial solutions in approximate equilibrium with subglacial calcite deposits. (2) The (Na + K)/(Ca + Mg) ratio of bubble-poor basal ice from Glacier de Tsijiore Nouve which flows over gneissic rocks is significantly higher than this ratio in other samples taken in the same environment (glacier ice, melt water). This may be explained by refreezing of squeezed water, the ionic composition of which is governed by selective diffucion of ions during squeezing and/or by the water being forced through mud layers as demonstrated by us at the base of Glacier d'Argentiere. (3) The Lead-210 activity per kg of basal ice from the south side of Glacier de Tsanfleuron is greater than that of the glacier ice immediately above, which indicates that it is younger despite percolation effects. This can be explained if recent ice accretion has occurred at the base of relatively old glacier ice. Accretion of blowing snow has been found to occur under the southern margin of the glacier. (See also W76-05403) (Humphreys-ISWS)
W79-00690

DETERMINATION OF THE MEAN NUMBER OF BONDS PER SNOW GRAIN AND OF THE DEPENDENCE OF THE TENSILE STRENGTH OF SNOW ON STEREOLOGICAL PARAMETERS,
Eidgenossische Inst. fur Schnee- und Lawinenforschung, Davos (Switzerland).
H. Gubler.
Journal of Glaciology, Vol 20, No 83, p 329-341, 1978. 10 fig, 1 tab, 10 ref.

Descriptors: *Snow, *Tensile strength, *Mathematical models, Physical properties, Theoretical analysis, Density, Mechanical properties, Model studies, Analytical techniques, Laboratory tests, *Snow structure, Snow grains, Density distribution, Grain bonds.

A theoretical density distribution of the number of bonds per grain as a function of the mean number of bonds per grain was derived from the assumption of a randomness and isotropy of grain and grainbound location and orientation. The knowledge of the theoretical density distribution allows the determination of the effective distribution parameters from section planes or thin sections. The concept of the fundamental unit to describe the strength of snow was introduced. Structural parameters developed on the basis of the fundamental units show improved correlations with the tensile strength. (Humphreys-ISWS)
W79-00691

AN ALTERNATE STATISTICAL INTERPRETATION OF THE STRENGTH OF SNOW,
Eidgenoessiche Inst. fur Schnee- und Lawinenforschung, Davos (Switzerland).
H. Gubler.
Journal of Glaciology, Vol 20, No 83, p 343-357, 1978. 10 fig, 1 tab, 12 ref.

Descriptors: *Snow, *Strength, *Mechanical properties, *Statistical models, Ductility, Model studies, Mathematical models, Statistical methods, Analytical techniques, Distribution patterns, Cracks, Analysis, Foreign research, Brittle strength.

The basic features of the statistical models to describe brittle and ductile strength of snow were outlined and discussed. The concept of the 'fundamental unit' was introduced. The models were applied to estimate the development of slab stability during heavy snowfalls and to simulate measurements of the tensile strength of snow using the centrifugal method as a function of the load rate. The models developed were compared with Sommerfeld's applications of statistical methods to estimate the strength of snow in the starting zone of a slab avalanche. Statistical models to estimate the strength of snow together with consistent definitions of the fundamental unit may lead to a better understanding of brittle and ductile strength of snow in terms of structural or stereological parameters. (See also W74-02745 and W75-10651) (Humphreys-ISWS)
W79-00692

DIELECTRIC BEHAVIOUR OF DISPERSE ICE MICROCRYSTALS IN THE FREQUENCY RANGE 100,000 TO 0.01 HZ,
Laboratoire de Thermodynamique des Etats Metastables et de Physique Moleculaire, Pau (France).
C. Lafargue, S. Bourgeois, and G. Evrard.
Journal of Glaciology, Vol 20, No 83, p 359-365, 1978. 5 fig, 2 tab, 6 ref.

Descriptors: *Ice, *Laboratory tests, *Activation energy, Heating, Electromagnetic waves, Temperature, Frequency, Melting, Dispersion, Analysis, Testing procedures, *Dielectric properties, Microcrystals, Polycrystalline ice.

Dielectric properties of ice microcrystals were studied in the frequency range 300,000 to 0.01 Hz. Two separated dispersions were revealed: the Debye dispersion of ice and another dispersion at very low frequencies. Both dispersions present an aging effect, with decreasing activation energy for the Debye dispersion and with increasing activation energy for the second one. It was shown that the sum of these activation energies retains a constant value of (1.05 + or - 0.02) eV. (Humphreys-ISWS)
W79-00693

GLACIAL EROSION BY THE LAURENTIDE ICE SHEET,
Aberdeen Univ. (Scotland). Dept. of Geography.
D. E. Sugden.
Journal of Glaciology, Vol 20, No 83, p 367-391, 1978. 14 fig, 47 ref.

Descriptors: *Glaciology, *Erosion, *Canada, *Geomorphology, Glaciers, Ice, Geologic investigations, Glaciation, Geology, Topography, Freezing, Pleistocene epoch, Analysis, Methodology, Analytical techniques, Scour, Abrasion, Movement, Laurentide ice sheet, Ice flow.

The aim of the paper was to analyze landscapes of glacial erosion associated with the Laurentide ice sheet at its maximum and to relate them to the three main variables affecting glacial erosion, namely former basal thermal regime of the ice sheet, the topography of the bed, and the geology of the bed. The key to the analysis is the comparison of the distribution of landscape types with the simulated pattern of the basal thermal regime of the former ice sheet. Using lake-basin density as an indication of the intensity of glacial erosion, a zone of maximum erosion was identified. This zone forms a ring between the center of the former ice sheet and its periphery. This ring coincides with a zone where melt water from the ice-sheet center is calculated to have frozen on to the bottom of the ice sheet. This regelation incorporated basal debris into the ice, forming a basal layer 20-50 m thick, and afforded an efficient means of debris evacuation. A conceptual model was developed and was based upon the following postulates: (1) Landscapes of glacial erosion are related primarily to the basal thermal regime of the

ice sheet. (2) Landscapes of glacial erosion are equilibrium forms related to maximum glacial conditions. This implies that at some stage in the Pleistocene the Laurentide ice sheet was in a stable maximum condition for a long period of time. (3) Mechanisms allowing evacuation of debris rather than those of abrasion or fracture may be the most important in influencing the amount of erosion achieved by an ice sheet. (4) Cold-based ice may accomplish erosion if it contains debris. (Humphreys-ISWS)
W79-00694

FORMER ICE SHELVES IN THE CANADIAN HIGH ARCTIC,
Alberta Univ., Edmonton. Dept. of Geography.
J. England, R. S. Bradley, and G. H. Miller.
Journal of Glaciology, Vol 20, No 83, p 393-404, 1978. 5 fig, 1 tab, 42 ref. NSF OCD-00975.

Descriptors: *Ice, *Canada, *Geomorphology, *Dating, *Arctic, Glacial drift, Radioactive dating, Carbon radioisotopes, Stratigraphy, Amino acids, Age, On-site investigations, Quaternary period, *Ellesmere Island, Ice shelf.

Moraines deposited by the outermost ice advance across Judge Daly Promontory, northeastern Ellesmere Island, reflect thin, topographically controlled ice lobes extending to sea level. The termini of two ice lobes were investigated, and both produced ice shelves where they flowed into isostatically depressed embayments along western Kennedy Channel. Morphological evidence for these ice shelves occurs at the entrance to these valleys where steeply descending lateral moraines become abruptly horizontal for 2 km. In addition, both the horizontal moraines and associated proglacial terraces are fossilferous down-valley from the apparent grounding line. Based on the differences in elevation between the horizontal moraines and the valley bottoms, the two ice shelves had estimated thicknesses of 110 and 150 m. A proglacial outwash terrace at 175 m a.s.l. is considered to represent the approximate relative sea level during the formation and break-up of the ice shelves. This relative sea level is consistent with the water depths required to float the calculated ice thicknesses in both valleys. Associated with these ice margins are finite 14C dates of 28000-30000 B.P. and amino-acid age estimates of greater than 35000 B.P. The importance and likelihood of additional past ice shelves in the Canadian High Arctic was discussed. (Humphreys-ISWS)
W79-00695

RECORDING WIRE STRAINMETERS ON THE BARNES ICE CAP, BAFFIN ISLAND, CANADA,
Cambridge Univ. (England). Dept. of Geodesy and Geophysics.
K. Evans, D. J. Goodman, and G. Holdsworth.
Journal of Glaciology, Vol 20, No 83, p 409-423, 1978. 11 fig, 4 tab, 12 ref, 2 append.

Descriptors: *Ice, *Strain measurement, *Instrumentation, *On-site tests, *Canada, On-site investigations, Strain, On-site data collections, Strain gages, Rates, Analysis, Testing procedures, *Baffin Island(Canada), *Barnes Ice Cap, Ice caps.

The report described an experiment to evaluate the use of geophysical (Cambridge-type) wire strainmeters for the rapid acquisition of strain-rate data and to compare strains on a large ice mass over gauge distances of 5 m, 50 m, and 1 km. Three continuously recording wire strainmeters were installed at the center of two separate arrays of strain poles 10.6 km and 19.5 km from the ice divide on the Barnes Ice Cap. Data were collected between 24 April and 15 May 1976. The 1 km strain arrays had been measured previously in 1974 and 1975. The results showed good agreement between the strainmeter data and the larger strain arrays at the 10.6 km site, but results differed at the 19.5 km site. When the daily means were calculated for the strainmeters at the 19.5 km site, the strain-rates showed a possible periodic variation with an apparent period of about 11 d. Since there appears to be no direct correlation between the strainmeters signal and either temperature or pressure, the result was assumed to represent real varying strain within the ice. (Humphreys-ISWS)
W79-00696

AN INVESTIGATION INTO THE USE OF STRAIN ROSETTES FOR THE MEASUREMENT OF PROPAGATING CYCLIC STRAINS,
Scott Polar Research Inst., Cambridge (England).
V. A. Squire.
Journal of Glaciology, Vol 20, No 83, p 425-431, 1978. 6 fig, 11 ref.

Descriptors: *Strain measurement, *Sea ice, *Instrumentation, *On-site tests, Strain, Strain gages, Ice-water interfaces, Waves(Water), Analytical techniques, Analysis, Measurement, Gravity waves, Frequency, *Newfoundland, *Notre Dame Bay(Newfoundland), Strainmeter rosettes, Principal strain, Principal axes.

An investigation into the feasibility of using a strain rosette to measure the principal strains and to locate the principal axes for propagating strain wave was carried out for the particular application of a flexural-gravity wave in sea ice. It was found that the separation of the instruments in the rosette is extremely critical, and, for a physically realizable rosette, errors are unavoidable if strain is to be monitored continuously. An alternative approach was proposed employing frequency-domain analysis and in particular a running-power spectral density. The method was demonstrated with data obtained from strainmeters on fast ice in Notre Dame Bay, Newfoundland. Two distinct wave components were found to be present of period 6 s and 13 s, and it was shown with 99.9% confidence that they are propagating in different directions. (Humphreys-ISWS)
W79-00697

A MECHANICAL TEST PROCEDURE FOR AVALANCHE SNOW,
Beck (R. W.) and Associates, Denver, CO.
S. L. McCabe, and F. W. Smith.
Journal of Glaciology, Vol 20, No 83, p 433-438, 1978. 4 fig, 1 tab, 12 ref.

Descriptors: *Snow, *Strain measurement, *Instrumentation, *On-site investigations, On-site tests, Avalanches, Stress, Strain, Mechanical properties, Strength, Measurement, Methodology, Test procedures.

The design, construction, and testing of a portable constant strain-rate testing machine for determining the mechanical behavior of avalanche snow were described. The machine is intended for use in determining the stress-strain-time behavior of low-density natural snows in the field. A technique for making direct measurements of strain in the snow sample was described, and stress-stran curves were presented for strain-rates ranging from 0.000005 to 0.00005/s. The densities of the snow samples tested ranged from 186 to 335 kg/cu m. Ultimate-strength data and relaxation curves also were presented. In order to provide stress-strain-strain-rate data which will be useful for stress and deformation finite-element modelling of avalanche snow-packs, it will be necessary to conduct tests at lower strain-rates and for longer time periods. It also may be necessary to conduct tests with larger samples to avoid problems caused by the presence of flaws in the snow. (Humphreys-ISWS)
W79-00698

HEAT AND MASS TRANSPORT PROCESSES IN SUBSEA PERMAFROST I. AN ANALYSIS OF MOLECULAR DIFFUSION AND ITS CONSEQUENCES,
Alaska Univ., Fairbanks. Geophysical Inst.
W. D. Harrison, and T. E. Osterkamp.
Journal of Geophysical Research, Vol. 83, No. C9, p 4707-4712, September 29, 1978. 2 fig, 25 ref. NOAA 04-5-158-35, 04-6-158-44039, 04-7-158-44006 NSF DPP76-18399.

Descriptors: *Permafrost, *Alaska, *Heat transfer, *Mass transfer, *Model studies, *Arctic, Mathematical models, Oceans, Cold regions, Diffusion, Thawing, Temperature, Salinity, Salts, Bays, Shores, *Beaufort Sea(Alaska), *Prudehoe Bay(Alaska), *Subsea permafrost.

Some heat and mass transport processes in subsea permafrost were discussed. An exact solution was given for a coupled model in which both heat and salt are transported solely by diffusion. The model describes the development of a thawed layer beneath the seabed after an ocean transgression over deeply frozen ground and is a generalization of the well-known Stefan problem. A stability calculation indicated that such a diffusive regime should be unstable to convection of the interstitial water in the thawed layer after a critical thickness has been reached. The theory was compared with observations from two sites in the Beaufort Sea, Alaska. In western Elson Lagoon, near Barrow, the diffusive regime may be stable, but at Prudhoe Bay it is not, and interstitial water motion is important. At Prudhoe Bay the salt and heat transport regimes are convective and diffusive, respectively. (Sims-ISWS)
W79-00700

PROBABILITY ESTIMATE OF SNOW-COVER DEPTH DISTRIBUTION,
I. D. Kopanev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 281-287, 1976. 2 fig, 8 tab, 14 ref. Translated from Trudy Glavnoi Geofizicheskoi Observatorii, No. 349, p 3-15, 1976.

Descriptors: *Snow cover, *Depth, *Probability, *Distribution patterns, Snow, Snow surveys, Data processing, Analytical techniques, Forests, Snowfall, Statistica, Variability, Water resources, *USSR.

Snow cover distribution in a particular region is determined by many factors, which cannot always be taken into account quantitatively. Statistical, along with physical methods, have been used extensively in recent years to solve many scientific and practical problems in hydrometeorology. An extensive literature is devoted to snow cover distribution in the USSR, mainly to its average and extreme characteristics. Not only data on average snow cover depth, but also on its probability in a particular area are required to satisfy the demands of many branches of the national economy. Data on snow cover distribution in the USSR are given in the 35 volumes of the Climatic Handbook of the USSR for individual points. It is difficult to use this extensive and disconnected information on snow cover for practical and scientific purposes. Snow cover dpeth distributions were analyzed over the territory of the Northwestern Hydrometeorological Service Aministration by mathematical statistics. To this end, snow survey data were used for the period of 1935-1964 at 142 stations. Of these, 93 stations performed snow surveys in the field and 49 stations in the forest and in forest clearings. This analysis of the data showed that the snow cover distribution in the territory of the Northwestern Hydrometeorological Service Administration is normal. (Sims-ISWS)
W79-00705

KOLYMA WATER BALANCE STATION, MAGADAN OBLAST, NORTHEAST U.S.S.R.: UNITED STATES-SOVIET SCIENTIFIC EXCHANGE VISIT,
Forest Service (USDA), College, AK. Inst. of Northern Forestry.
For primary bibliographic entry see Field 4D.
W79-00716

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME I.
National Oceanic and Atmospheric Aministration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00895

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00896

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME III.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00897

2E. Streamflow and Runoff

STATISTICAL SUMMARY OF STREAMFLOW DATA FOR KANSAS STREAMS IN THE ARKANSAS RIVER BASIN,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00626

FLOODS IN KANSAS CITY, MISSOURI AND KANSAS, SEPTEMBER 12-13, 1977,
Geological Survey, Rolla, MO. Water Resources Div.; and Geological Survey, Topeka, KS. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-00638

STREAMS AND DRAINAGE BASINS, FULTON COUNTY, NEW YORK,
Fulton County Planning Dept. Johnstown, NY.
For primary bibliographic entry see Field 4A.
W79-00664

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 4A.
W79-00800

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W79-00813

AN EXPERIMENTAL STUDY OF FLOW AND OXYGEN TRANSFER IN CIRCULATION INDUCED BY AIR BUBBLE PLUMES,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
C. J. Wen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 388, Price codes: A10 in paper copy, A01 in microfiche. Master of Science Thesis, June 1974. 195 p, 79 fig, 7 tab, 45 ref, 7 append. OWRT A-030-NH(3), 14-31-0001-3829.

Descriptors: Absorption, *Mixing, Oxygen, *Water circulation, Water quality, Air movement, Circulation, *Aeration, Dissolved oxygen, Measurement, Mass transfer, Model studies, Jets, Velocity measurement, Manifolds, *Vertical plumes, *Oxygen transfer, *Air bubble plumes, *Mixing device.

Experimental studies of the patterns of circulation and flow induced by aeration from point and line sources submerged in water have been carried out in the laboratory. The influence of the system variables such as aerator design, water depth and air supply rate, on the induced flow were studied. Efforts were made to extend and clarify the work of previous similar studies for aeration from linear systems. The experimental results are generally in good agreement with those obtained by previous investigators. The ratio of induced water discharge relative to air discharge as a measure of aeration efficiency has been examined and found to increase with manifold submergence depth and decrease with increasing air discharge rate within certain limits. A comparison of the induced flow patterns between the plane water jet and linear air bubble plume system has been made. In addition, an efficiency criterion for comparing these two systems was proposed for a given set of conditions. Measurements are presented of the transfer rate of dissolved oxygen in water from rising air bubbles released from a linear manifold. A simple mass transfer model successfully correlates the data with only one lumped constant which is a function primarily of aeration rate and manifold characteristics.
W79-00856

A FLASH FLOOD AID - THE LIMITED AREA QPF,
National Weather Service, Fort Worth, TX. Southern Region.
For primary bibliographic entry see Field 2B.
W79-00994

2F. Groundwater

A GROUNDWATER RECHARGE MODEL AND APPLICATION TO A SMALL WATERSHED,
Nebraska Univ., Lincoln.
D. M. Manbeck, and M. Arbab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 118, Price codes: A04 in paper copy, A01 in microfiche. Nebraska Water Resources Center Project Completion Report, September 1977. 60 p, 15 fig, 3 tab, 26 ref, 1 append. OWRT A-042-NEB(1).

Descriptors: *Mathematical models, *Watersheds(Basins), *Groundwater movement, *Groundwater recharge, *Nebraska, *Runoff, Soil moisture, Evapotranspiration, Soil water movement, Percolation, Soil water, Equations, Water table, Precipitation(Atmospheric), Irrigation, Computer models, Simulation analysis, Test wells, Groundwater resources, Forecasting.

A mathematical simulation model for tracing the movement of precipitation from soil surface to the groundwater table was developed. Required input for the model includes: mean monthly air temperature, monthly precipitation, and soil moisture characteristics. It applies a series of deterministic equations to relate precipitation to infiltration, compute surface runoff, evapotranspiration, deep percolation, and the recharge to the groundwater zone. The model can be used to determine the amount of water from precipitation and irrigation which moves vertically downward from one soil level to the next on a monthly basis for various initial soil conditions. The model was applied to simulate conditions of a small watershed in southeastern Nebraska. The simulation predictions of runoff, evapotranspiration, moisture profile, and groundwater recharge. However, because of inavailability of observed data, only computed runoff was compared to the observed and found to match closely. Groundwater level observations in the area were used to check the computed recharge to the groundwater zone but they were found to be more than the model. This is due to groundwater flow, which moves from high water table areas towards the natural streams in the northern part of the watershed area where the observation well is located. (Majtenyi-IPA)
W79-00508

DOLOMITIZATION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Geology.
A. F. Randazzo, and E. W. Hickey.
In: Proceedings, Second International Symposium on Water-Rock Interaction, Strasbourg, August 17-25, 1977. p I82-I91, 1 fig, 2 tab, 18 ref. Centre National de la Recherche Scientifique, Strasbourg, France. OWRT B-032-FLA(2), 14-34-0001-7148.

Descriptors: *Groundwater movement, Porosity, Permeability, Groundwater resources, *Limestones, Petrography, Water management(Applied), *Aquifers, Facies, *Diagenesis, *Florida, *Dolomitization.

Lithofacies, representing multiple transgressive-regressive cycles of sedimentation, characterize 20 cores penetrating the Floridan Aquifer. Original texture is preserved more frequently in rocks deposited in a supratidal environment and replaced by stoichiometric dolomite. Non-stoichiometric dolomite commonly is associated with obscured or obliterated limestone fabrics. Strontium in both dolomite groups generally is less than 200 ppm and indicates crystallization in a solution less saline than seawater. Dolomitization continued with time as rocks of supratidal and other environments of the area were subjected to repeated lateral migrations of a salt water - fresh water interface and phreatic groundwater conditions. (Morgan-Florida)
W79-00532

AVAILABILITY AND QUALITY OF GROUND WATER IN THE WINSTON AREA, DOUGLAS COUNTY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00620

TOWARD A RATIONAL DEVELOPMENT OF ARTIFICIAL-RECHARGE RESEARCH,
Geological Survey, Lubbock, TX. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-00632

OCCURRENCE, QUALITY, AND AVAILABILITY OF GROUND WATER IN JONES COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
R. D. Price.
Report 215, April 1978. 246 p, 40 fig, 12 tab, 60 ref.

Descriptors: *Texas, *Groundwater, *Groundwater availability, *Water quality, *Data collections, Aquifers, Census, Water wells, Well data, Groundwater resources, Hydraulic properties, Chemical analysis, Drillers logs, Springs, Geology, Irrigation wells, Water level fluctuations, Aquifer characteristics, Dissolved solids, Climatology, Groundwater recharge, Geologic formations, *Jones County(Texas), Chemical quality, Seymour formation, Choza formation, Vale formation, San Angelo formation.

The scope of this project included the collection, compilation, and analysis of data pertaining to the distribution and quality of groundwater in the county. Special emphasis was placed on determin-

ing the sources of water suitable for municipal, industrial, irrigation, domestic, and livestock use. Areas and possible sources of present or potential groundwater contamination were delineated. Jones County, with an areal extent of approximately 950 sq mi, is located in north-central Texas. The most reliable source of usable-quality groundwater in Jones County is the Seymour Formation which yields fresh to moderately saline waters in small to moderate quantities. The chemical analyses of water samples indicated that only a few scattered areas of Jones County produce groundwaters that meet the chemical quality standards recommended for public supplies by the U.S. Public Health Services. The water commonly have a high content of sulfate, nitrate, chloride, and dissolved solids. To further evaluate the future effects of heavy irrigation or industrial pumpage from the various aquifers, a network of 19 observation wells has been established in which water levels are planned to be measured and recorded annually. (Humphreys-ISWS)
W79-00709

CALCULATION OF DAILY GROUNDWATER LEVELS IN SWAMPS USING METEOROLOGICAL DATA,
For primary bibliographic entry see Field 4B.
W79-00715

2G. Water In Soils

EFFECTS OF SOIL INJECTION OF LIQUID DAIRY MANURE ON THE QUALITY OF SURFACE RUNOFF,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W79-00528

INFLUENCE OF WATER AND FERTILIZER MANAGEMENT ON YIELD AND WATER-INPUT EFFICIENCY OF CORN,
Florida Univ., Quincy.
For primary bibliographic entry see Field 5B.
W79-00530

SOIL WATER MOVEMENT AND UPTAKE BY PLANTS DURING WATER INFILTRATION AND REDISTRIBUTION,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, L. C. Hammond, and R. S. Mansell.
Soil and Crop Science Society of Florida Proceedings, Vol. 36, p 101-107, November 16-18, 1976. 13 fig, 14 ref. OWRT A-034-FLA(1), 14-34-0001-8010.

Descriptors: *Irrigation efficiency, *Deep sands, *Controlled root-zone wetting, Evapotranspiration, Drainage, Subsurface asphalt barrier, Water storage, Deep water seepage, Two-layered soils, *Soil water movement, Infiltration, *Redistribution(Plants), Vegetation.

A numerical solution of the equation governing soil water movement and uptake by plants during infiltration and redistribution was used to investigate the influence of the amount of irrigation and soil nonuniformity on deep seepage loss and soil water storage in the root zone. For a uniform Lakeland sandy soil the deep seepage loss increased as the amount of water applied in an irrigation event increased. However, the presence of a low permeability lower layer in a two-layered soil profile was beneficial in increasing soil water storage and in minimizing deep seepage loss. Such a decrease in deep seepage loss was more pronounced when large amounts of irrigation were applied and the hydraulic conductivity of the lower layer was extremely small. For small irrigations, the influence of a low permeability lower layer on deep seepage loss was essentially negligible. (Morgan-Florida)
W79-00535

CHANGES IN THE CHARACTER OF MEADOW PLANT COMMUNITIES INDUCED BY THE OVERFLOW AND STAGNATION OF SALT WATER, (IN POLISH),
Polish Academy of Sciences, Krawkow. Inst. Uprawy Roli Roslin.
For primary bibliographic entry see Field 5B.
W79-00610

FIELD DETERMINATION OF VERTICAL PERMEABILITY TO AIR IN THE UNSATURATED ZONE,
Geological Survey, Lubbock, TX. Water Resources Div.
E. P. Weeks.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.90. Professional Paper 1051, 1978. 41 p, 12 fig, 6 tab, 50 ref.

Descriptors: *Permeability, *Hydraulic conductivity, *Zone of aeration, *Atmospheric pressure, *Analog models, Infiltration, Soil water movement, Absorption, On-site investigations, Evaluation, *Unsaturated zone.

The vertical permeability to air of layered materials in the unsaturated zone may be determined from air pressure data obtained at depth during a period when air pressure is changing at land surface. Such data may be obtained by monitoring barometric pressure with a microbarograph or surveying altimeter and simultaneously measuring down-hole pneumatic head differences in specially constructed piezometers. These data, coupled with air-filled porosity data from other sources, may be compared with the results of electric-analog or numerical solution of the one-dimensional diffusion equation to make a trial-and-error determination of the air permeability for each layer. The permeabilities to air may in turn be converted to equivalent hydraulic conductivity values if the materials are well drained, are permeable enough that the Klinkenberg effect is small, and are structurally unaffected by wetting. The method offers potential advantages over present methods to evaluate sites for artificial recharge by spreading; to evaluate ground-water pollution hazards from feedlots, sanitary landfills, and land irrigated with sewage effluent; and to evaluate sites for temporary storage of gas in the unsaturated zone. (Woodard-USGS)
W79-00624

MAGNETIC RELAXATION STUDY OF WATER MOBILITY IN CLAY MINERALS,
North Dakota Univ., Grand Fork.
J. J. Schneider, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 316, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, August 1977, 36 p, 15 fig, 2 tab, 15 ref. OWRT A-051-NDAK(1), 14-34-0001-7072.

Descriptors: *Soil moisture, Absorbed water, Soil physical properties, Calcium, Montmorillonite, Kaolin, Pulse nuclear, *Magnetic resonance, *Clays, Sodium.

Longitudinal and transverse relaxation rates of the protons of water molecules adsorbed by Na- and Ca-montmorillonite and untreated kaolin were measured by use of the pulse NMR technique. The Na-montmorillonite and kaolin samples contained 10% and 60% water by weight and the Ca-montmorillonite samples contained 20% and 60% water. The montmorillonite samples were studied between +20C and -136C and the kaolin samples between +20C and -30C. The longitudinal relaxation of the kaolin samples was exponential above 0C and distinctly non-exponential below 0C. The transverse relaxation of the kaolin samples was approximately exponential both above and below 0C but decreased considerably when the samples were cooled through 0C. Such behavior suggests a partial freezing of the absorbed water at 0C. For the montmorillonite samples no discontinuous variation in the relaxation was observed as the temperature was lowered. The longitudinal relaxation was approximately exponential at the highest temperatures and became increasingly nonexponential as the temperature was lowered. Below -30C the relaxation was resolved into two exponential components, although it could probably be described by using more than two exponential terms. The short, long and average longitudinal relaxation times for all montmorillonite samples went through minima between -50C and -60C. The values of the relaxation times at the minima are smaller than would be expected due to nuclear dipole-dipole interactions alone and are explained in terms of the effect of paramagnetic impurities. Correlation times and activation energies for the protonic motion and relaxation times of the paramagnetic centers have been obtained from the proton longitudinal relaxation. The transverse relaxation of the montmorillonite samples was approximately exponential at all temperatures. T2 appeared to approach a temperature independent maximum value at high temperatures and a rigid lattice value at low temperatures. After corrections for the high temperature effect, activation energies were calculated from linear portions of the T2 curves.
W79-00679

INVESTIGATION OF THE LIQUEFACTION POTENTIAL AT THE W.G. HUXTABLE PUMPING PLANT SITE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W79-00713

THE ADSORPTION-DESORPTION OF DIURON BY FRESHWATER SEDIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W79-00860

FIELD CHAMBER MEASUREMENTS OF CO2 FLUX FROM SOIL SURFACE,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2K.
W79-00871

GALERKIN METHOD FOR A NON-LINEAR PARABOLIC EQUATION WITH MIXED NONLINEAR BOUNDARY CONDITIONS,
California Univ., Santa Barbara. Coll. of Engineering.
J. M. Sloss, J. C. Bruch, Jr., and G. Zyvoloski.
Available from the National Technical Information Service. Springfield, VA 22161 as PB-288 429, Price codes: A04 in paper copy, A01 in microfiche. College of Engineering Report UCSB-ME-77-1, (1977). 62 p, 9 ref. (California Water Resources Center Project UCAL-WRC-W-336) (OWRT-A-039-CAL(15).

Descriptors: Computer programs, *Mathematical studies, *Approximation methods, *Galerkin method, *Equations, Porous media, *Unsteady flow, *Crank-Nicolson approximation, Boundary processes, Interfaces.

Error estimates are derived for a numerical scheme for finding an approximate solution to nonlinear parabolic equations in the plane with mixed nonlinear boundary conditions. The scheme involves the Galerkin method coupled with successive substitutions and the Crank-Nicolson approximation. Problems of this type arise when considering unsteady, unsaturated flows in porous media. (Snyder-Calif, Davis)
W79-00900

NMR INVESTIGATION OF MOBILITY OF WATER SORBED BY CLAY MINERALS,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 2K.
W79-00910

POLYCHLORINATED BIPHENYLS, CHLORINATED PESTICIDES AND TRACE METALS IN SOILS OF THE EVERGLADES NATIONAL PARK AND ADJACENT AGRICULTURAL AREAS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 5B.
W79-00934

A SIMULATION MODEL FOR LEAD MOVEMENT IN A WATERSHED,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-00954

2H. Lakes

NUTRIENT INPUTS AND ALGAL BLOOMS IN IOWA LAKES,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5C.
W79-00510

DEVELOPMENT OF AN OPERATIONAL NORTHERN AQUATIC ECOSYSTEM MODEL,
Alaska Univ., College. Inst. of Water Resources.
R. F. Carlson, P. M. Fox, and J. D. LaPerriere.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 310, Price codes: A02 in paper copy, A01 in microfiche. Report No. IWR-82, June 1977. 10 p. OWRT C-6169(No. 5217)(1), 14-31-0001-5217.

Descriptors: *Model studies, *Ecosystems, *Lakes, *Alaska, *Water resources development, Water resources management, Limnology, Iced lakes, Ice cover, Ice breakup, Hydroelectric power, Fish hatcheries, Evaluation, Computer models, Simulation, Aquatic environment, Aquatic life, Climatology, Sampling.

Adaptation of a pre-existing model ecosystem was studied for application to management problems of Northern lakes and suggestions were made for appropriate strategy for simulating aquatic ecosystems in cold regions. Harding Lake was used as a case study because it is easily accessible, located 80 km southeast of Fairabanks. Also, it is a rather large, deep subarctic lake and provide good field data for the modeling project. Areas of interest included general constituent levels, certain aspects of lake geometry, and climatic conditions. Spring breakup is a very important season in artic limnology, yet is difficult to simulate because of the unstable nature of the water column during that period. Other weaknesses of the simulation involve other ice-related phenomena, the biological portion of the model, and the difficulty in detecting errors because of shielding by internal interaction. However, many of these problems were solved and the model was adapted for use on northern lakes. Potential applications for the model were identified, including reservoirs of a large hydroelectric project in southcentral Alaska, a salmon hatchery supply lake, and other lake and reservoir management schemes throughout the state.
W79-00513

EFFECTS OF MECHANICAL MIXING IN RESERVOIRS ON SEASONAL AND ANNUAL GROWTH RATES OF FISHES,
Oklahoma State Univ. Stillwater. School of Biological Sciences.
G. E. Gebhart, and M. D. Clady.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 334, Price codes: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Final Technical Completion Report, December 1977. 42 p, 1 fig, 21 tab, 32 ref. OWRT A-069-OKLA(1).

Descriptors: *Destratification, *Mixing, *Lakes, *Fish, *Fish conservation, *Habitats, *Habitat improvement, Oklahoma, Nutrients, Channel catfish, Freshwater fish, Gizzard shad, White crappie, White bass, Ecology, Water quality, Surveys, Evaluation, Aquatic environment, Reservoirs.

The effect of mechanical mixing carried out on Lake Arbuckle, Oklahoma, in 1977, was investigated by measuring seasonal and annual growth rates of fish. In 1976 and in 1977 after mixing, fish were taken using gill nets, and scales and spines were examined to reveal the effect on growth rates. The mixing attempt to destratify the reservoir and improve fish environment did increase the habitat available to the fish. Seasonal growth rates of gizzard shad and channel catfish, which are bottom feeders, were greater during the destratified period when more of the bottom area was available for feeding. Pelagic feeders like white crappie and white bass were less adversely affected by the loss of bottom habitat. Mechanical mixing increased the amount of available fish habitat in late summer which probably benefited growth, but the best growth occurred when available fish habitat was expanded in early summer. To maximize growth, mixing should begin in early May with the objective of preventing vertical stratification.
W79-00514

PRODUCTIVITY OF OEDOGONIUM IN LAKE WINGRA, WISCONSIN,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00522

MICROBIOLOGICAL STUDY OF A HYPERSALINE LAKE IN FRENCH SOMALILAND,
Centre Hospitalo-Universitaire-Poitiers (France). Bacteriology Virology Lab.
For primary bibliographic entry see Field 5C.
W79-00523

DETRITUS IN THE LAKE ECOSYSTEM,
Connecticut Univ., Storrs. Biological Sciences Group.
For primary bibliographic entry see Field 5C.
W79-00552

FOOD SIZE SELECTION AND SEASONAL SUCCESSION OF FILTER FEEDING ZOOPLANKTON IN AN EUTROPHIC LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W79-00554

ENZYMATIC RELEASE OF PHOSPHATE IN WATER FROM SUBARCTIC LAKES IN NORTHERN SWEDEN,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W79-00559

THE OCCURRENCE OF INTERNAL PHOSPHORUS LOADING IN TWO SMALL, EUTROPHIC GLACIAL LAKES IN NORTHEASTERN OHIO,
Kent State Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-00560

NUTRIENT LIMITATION OF PHYTOPLANKTON IN A CENTRAL ARIZONA RESERVOIR,
Arizona State Univ., Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W79-00562

AMMONIA-NITROGEN EXCRETION IN DAPHNIA PULEX,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-00563

SESTON DYNAMICS AND TRIPTON SEDIMENTATION IN THE PELAGIC ZONE OF A SHALLOW EUTROPHIC LAKE,
Wisconsin Univ.-Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W79-00567

A MODEL OF RENEWABLE RESOURCES AND LIMITATION OF DEPOSIT-FEEDING BENTHIC POPULATIONS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
For primary bibliographic entry see Field 5C.
W79-00575

ACID LAKE RENOVATION,
Peabody Coal Co., Central City, KY. Regional Lab.
For primary bibliographic entry see Field 5G.
W79-00576

PIGMENT DIVERSITY IN FRESHWATER PHYTOPLANKTON. II. SUMMER-SUCCESSION IN THREE DUTCH LAKES WITH DIFFERENT TROPHIC CHARACTERISTICS,
Amsterdam Univ. (Netherlands). Limnological Lab.
For primary bibliographic entry see Field 5C.
W79-00595

ALGAE OF BIOLOGICAL PONDS OF THE CHERKASSY CHEMICAL INDUSTRY (IN UKRANIAN),
Cherkasskii Pedagogical Inst. (USSR). Div. of Botany.
For primary bibliographic entry see Field 5C.
W79-00611

HYDROLOGIC RECONNAISSANCE OF TSALA APOPKA LAKE, CITRUS COUNTY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00639

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS WATER QUALITY MANAGEMENT STUDY. VOLUME I.
Templeton, Linke and Alsup, Salt Lake City, UT.; and Engineering Science, Inc., Berkeley, CA.
For primary bibliographic entry see Field 5G.
W79-00660

THE CHEMICAL COMPOSITION AND HYDROCHEMICAL REGIME OF THE WATER IN LAKE VIITNA LINAJARV (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 5C.
W79-00662

EFFECTS OF A COASTAL FRONT ON THE DISTRIBUTION OF CHLOROPHYLL IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-00699

GREAT LAKES WATER LEVELS 1974. DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
National Ocean Survey, Detroit, MI. Lake Survey Center.
For primary bibliographic entry see Field 7C.
W79-00706

ECOLOGICAL AND PHYTOHISTORICAL INVESTIGATIONS OF LOWLAND BOG PLANT BIOTOPES OF OMBROTROPHIC BOG WITH SPECIAL RESPECT TO ITS POOLS AND LAKES IN NORTHWESTERN GERMANY, (IN GERMAN),
Kiel Univ. (West Germany). Botanisches Inst.
For primary bibliographic entry see Field 5C.
W79-00732

STUDIES ON A SALINE LAKE ECOSYSTEM,
Australian National Univ., Canberra. Dept. of Environmental Biology.
K. F. Walker.
Aust J Mar Freshwater Res. 24(1), p 21-71, 1973.

Descriptors: Anabaena-spiroides, Bacteria, Brachionus-plicatilis, Chroococcus, Ciliates, Climates, *Ecosystem, Energy, Evaporation flux, Gull, Gymnodinium-aeruginosum, Hexarthra-jenkinae, Insects, Lakes, Minerals, Necterosoma-penicillatum, Primary productivity, Rainfall, *Saline lakes, *Australia(Victoria), Tanytarsus-barbitarsis, Temperature, Trophic levels.

A descriptive study was made of a saline crater lake over 3 yr (1968-1970). Lake Werowrap is associated with the Red Rock scoria cone, western Victoria, Australia. Meteorological data were used to compute the hydrological and analytical energy budgets for 1969 and 1970. The main determinant of variations in lake salinity and volume was the evaporation/rainfall balance, although groundwater seepage also was implicated. The average rate of water renewal was 0.725 times per year. The annual heat budgets of the lake (mean, 1712 g cal/cm2) and the lake sediments (mean, 1218 g cal/cm2) were very small fractions of the total energy fluxes within the system. Energy fluxes were governed mainly by incident radiation, evaporation, back-radiation and sensible heat transfer. Chemically, the lake water is highly alkaline (pH 9.8), predominantly of sodium 'chlorocarbonate' composition, and showed stable ionic proportions despite salinity fluctuations. Inorganic N and P concentrations were high and influenced seasonally by a gull population breeding on a msall islet in the lake. Optical measurements indicated rapid light attenuation due to dissolved organic material and dense plankton populations. Considerable bacterial activity was indicated by high rates of 'dark' carbon-14 assimilation. Attention was given to the population dynamics of the rotifer Brachionus plicatilis, the dominant zooplankter, which attained peak densities in summer and autumn. Other zooplankton species included the rotifer Hexarthra jenkinae, 2 ciliates and larvae of aquatic and terrestrial insects, notably the dytiscid Necterosoma penicillatum, which occurred around the lake margins. The benthis community consisted solely of the chrionomid Tanytarsus barbitarsis.--Copyright 1974, Biological Abstracts, Inc.
W79-00734

SESTON AND SEDIMENT FORMATION IN FIVE LAKE DISTRICT LAKES,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W79-00738

COLONIAL BIRDS NESTING ON MAN-MADE AND NATURAL SITES IN THE U.S. GREAT LAKES,
Northwestern Michigan Coll., Traverse City.
W. C. Scharf.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report D-78-10 and FWS/OBS-78/15, May 1978. 328 p, 32 tab, 25 fig, 34 ref, 5 append.

Descriptors: *Birds, *Great Lakes, Habitats, *Nesting, *Vegetation, Islands, *Colonial birds, Dredged material.

Habitats and nesting populations of colonial nesting birds of the U.S. Great Lakes were determined by aerial census, ground nest observations, and vegetation analysis during 1976 and 1977. Thirteen species at 267 colonies were found. An atlas of nesting sites and populations of colonies is provided. Intensive vegetation and habitat studies were performed on 24 sites: 8 natural islands and 16 dredged material locations. A greater percentage of cover by herbaceous vegetation was favored by ring-billed gulls and herring gulls, but common and Caspian terns perferred less vegetative cover. Both ciconiiform and larid colonial nesters killed or badly stressed vegetation supporting, surrounding, and below their nests. Soil analysis showed high levels of macronutrients in most colonies except to a few adapted plant species frequently found in heavily fertilized ring-billed gull colonies. Colony size and previous experience of breeders seemed more important than latitude in determining date of peak hatching and chronological sequence of nesting in ring-billed gulls. The water table affected nesting success by changing vegetation from hydric to xeric seres. (WES)
W79-00765

MACROINVERTEBRATES AND DIATOMS ON SUBMERGED BOTTOM SUBSTRATES, LAKE POWELL,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00782

THE DISTRIBUTION OF AQUATIC WEEDS IN THE FINGER LAKES OF NEW YORK STATE AND RECOMMENDATIONS FOR THEIR CONTROL,
Eisenhower Coll., Seneca Falls, NY. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W79-00787

PHYTOPLANKTON PRODUCTIVITY IN TOMAHAWK LAGOON, LAKE WAIPORI AND LAKE MAHINERANGI,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-00799

THE KNOWLEDGE OF THE PLANKTON OF LAKES OF GREECE: III. THE ZOOPLANKTON OF LAKE VENGORITIS. (IN GERMAN),
For primary bibliographic entry see Field 5C.
W79-00808

PHYTOPLANKTON FROM WATERS OF KANEM (CHAD): IX. THE APPLICATION OF CORRESPONDENCE FACTORIAL ANALYSIS TO POPULATION STUDIES, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Djamena (Chad). Dept. of Hydrobiology.
A. Iltis, and M. Roux.
Cah O R S T O M Ser Hydrobiol. 8(2), p 93-104, 1974.

Descriptors: Anabaenopsis-arnoldii, *Chad, Flora, Kanem, Oscillatoria-platensis, Phytoplankton, Pond, Alkaline water.

Samples (171) of the saline waters of Kanem were studied by means of correspondence factorial analysis. The present taxa and samples of permanent waters are distributed in 3 great groups. In temporary ponds, 3 kinds of samples are distinguishable: samples taken during the beginning or the end of the flood period; samples with Oscillatoria platensis predominant and samples with Anabaenopsis arnoldii predominant. The affinities between the flora of temporary ponds and that of the most saline permanent lakes are confirmed. (See also W76-09596; W75-09020 and W75-06778) Copyright 1975, Biological Abstracts, Inc.
W79-00849

DIURNAL STRATIFICATION OF DEEP WATER IMPOUNDMENTS,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
B. F. Armaly, and S. P. Lepper.
The American Society of Mechanical Engineers, New York, N.Y. Reprint No 75-HT-35, 1975. 9 p. OWRT A-080-MO(2). 14-31-0001-4025.

Descriptors: Reservoirs, *Diurnal, *Temperature distribution, *Thermocline, *Stratification, *Impoundments, *Solar energy, Model studies.

The diurnal temperature distribution in a deep water impoundment which is exposed to heating and cooling loads by convection, evaporation and radiation is examined. The diurnal behavior of the solar load, directional and spectral, is used with the selective attenuation and reflection characteristics of the water to account for the internal solar energy absorption rate. Simple atmospheric and water attenuation models were used to examine and simulate the diurnal behavior. The results demonstrate the stratification developments of the reservoir and indicate that in some cases deep layer responds continuously to the diurnal fluctuations of surface energy loads.
W79-00874

ENTRAINMENT AT A ONCE-THROUGH COOLING SYSTEM ON WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Inst. of Water Research; and Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W79-00878

PHYTOPLANKTON FROM ALKALINE WATERS OF KANEM (CHAD): VIII. CLASSIFICATION OF ENVIRONMENTS STUDIED AND CHARACTERISTIC SPECIES, (IN FRENCH),
Lab. Hydrobiol., ORSTOM, N'Djamena, Chad.
A. Iltis.
Cah O R S T O M Ser Hydrobiol. 8(2), p 81-92, 1974.

Descriptors: Algae, Biotope, *Chad, *Classification, Environments, Kanem, *Lakes, *Phytoplankton, Pond, Species, *Alkaline water.

The rank correlation of Kendall, correlations of Bravais-Pearson and the definition of characteristic species by the method of the 'ecart reduit' permit the classification of the permanent lakes studied in 3 great biological zones. Temporary ponds, where the variations in salinity are continuous and important, compose particular biotopes, however, their algal flora has affinities with that of polycarbonated lakes. (See also W76-09596; W75-09020; and W75-06778)--Copyright 1975, Biological Abstracts, Inc.
W79-00893

IRON-ALGAE INTERACTIONS AS A FACTOR IN LAKE ERIE WATER QUALITY,
State Univ. of New York at Fredonia. Environmental Resources Center.
For primary bibliographic entry see Field 5C.
W79-00936

THE FRESH-WATER POLYCHAETE, MANAYUNKIA SPECIOSA, IN A THERMAL CHANNEL, CLEVELAND HARBOR LAKE ERIE.
Cleveland State Univ., OH. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00985

IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-00990

2I. Water In Plants

DROUGHT INJURY AND IRRIGATION EFFECT ON THE GROWTH AND YIELD OF WARM SEASON GRASSES CULTIVATED ON MINERAL SOIL, (IN JAPANESE),
Tokai-Kinki Natl. Agric. Exp. Stn., Ishinden-Ogoso, Tsu, Mie, Jpn.
For primary bibliographic entry see Field 3F.
W79-00516

OXYGEN PRODUCTIVITY OF PERIPHYTON ON HIGHER AQUATIC PLANTS (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
V. V. Yurchenko.
Gidrobiol Zh 13(4), p 49-52, 1977.

Descriptors: Algae, Epiphytes, Minerals, Aquatic plants, *Periphyton, *Oxygen productivity(Plants), Oxygen requirements.

When estimating the effect of higher water plants on the O2 regime of a water body they should be considered as a complex with periphyton which depending on conditions, may increase or decrease O2 in the water. At low transparency, when periphyton contains a lot of mineral particles and vacant cells of algae, it may absorb isolated by water plant. With high transparency and abundant epiphyte development, O2 isolated by algae is added to O2 produced by higher water plants.--Copyright 1978, Biological Abstracts, Inc.
W79-00529

PRELIMINARY GUIDE TO WETLANDS OF THE GULF COASTAL PLAIN, MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 705, Price codes: A05 in paper copy, A01 in microfiche. Technical Report Y-78-5, May 1978. 103 p, 10 fig, 82 ref, 3 app.

Descriptors: *Gulf Coastal Plain, *Plant populations, *Wetlands, *Marshes, *Marsh plants.

This guide to the major plant associations and communities found in wetlands within the Gulf Coastal Plain is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U.S. Army Engineer Districts for use in wetland identification in the implementation of Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The classification system in the guide is intended solely for use in the Section 404 permit program and is not considered a classification system for other purposes. (WES)
W79-00536

COLONIAL BIRD USE AND PLANT SUCCESSION ON DREDGED MATERIAL ISLANDS IN FLORIDA; VOL. II: PATTERNS OF PLANT SUCCESSION,
Seabird Research Inc., Culver City, CA.
For primary bibliographic entry see Field 6G.
W79-00544

UNDERGROUND BIOMASS DYNAMICS AND SUBSTRATE SELECTIVE PROPERTIES OF ATLANTIC COASTAL SALT MARSH PLANTS,
Georgia Univ., Sapelo Island. Marine Inst.
J. L. Gallagher, F. G. Plumley, and P. L. Wolf.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 761, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-28, December 1977. 167 p, 39 tab, 15 fig, 25 ref, 3 append.

Descriptors: *Biomass, *Marsh plants, *Salt marshes, *Atlantic coastal plains, *Dredged material, *Substrates, Coastal plains, Plant populations.

Provides information applicable to marsh development on dredged material, particularly methodologies that can be used for determining which marsh plants will be likely to do well on various kinds of dredged material and when a marsh, which has been established on dredged material, approaches natural conditions. Focuses on three major efforts: an investigation of underground biomass dynamics, characterization of soils supporting the salt marsh plants, and experimentation on the substrate selective properties of several of the marsh plants studied. The methods and results for the specific aspects of these three efforts are delineated in five self-contained sections of the report: underground biomass profiles and dynamics in Atlantic coastal marshes, comparison of some tidal marsh soils along the Atlantic Coast, response of salt marsh plant stands to a pulse of ammonium nitrate, salt marsh plant growth on three types of dredged material, and a bioassay approach to studying marsh plant root growth in natural soil and dredged material. Findings indicate that in developing salt marsh on dredged material, five substrate problems should be considered: stability, pH characteristics; salinity characteristics; soil characteristics; and nutrients, of which nitrogen appears to be the key element. (WES)
W79-00545

PRELIMINARY GUIDE TO WETLANDS OF PENINSULAR FLORIDA; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A054 191, Price codes: A05 in paper copy, A01 in microfiche. Technical Report Y-78-2, February 1978. 92 p, 12 fig, 75 ref, 3 append.

Descriptors: *Plant populations, *Wetlands, *Florida, *Classification.

This guide to the major plant associations and communities found in wetlands within peninsular Florida is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U.S. Army Engineer Districts for use in wetland identification in the implementation of Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The classification system in the guide is intended solely for use in the Section 404 permit program and is not considered a classification system for other purposes. (WES)
W79-00547

CHANGES IN THE CHARACTER OF MEADOW PLANT COMMUNITIES INDUCED BY THE OVERFLOW AND STAGNATION OF SALT WATER, (IN POLISH),
Polish Academy of Sciences, Krawkow. Inst. Uprawy Roli Roslin.
For primary bibliographic entry see Field 5B.
W79-00610

THE CONCEPT OF FLOODING OF BOTANICAL OBJECTS AND CLASSIFICATION OF FLOODING, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Central Republican Botanical Garden.
I. O. Davydenko.
Ukr Bot Zh 33(1), p 89-90, 1976.

Descriptors: *Plant physiology, *Flooding, Underflooding, *Classification(Botanical), Groundwater level, Soil-water-plant relationships.

Underflooding is defined as flooding caused by the rise in groundwater level due to the raising of capillary fringe or partial drowning of a plant in the substrate. The effects of the underflooding on the plant are classified as stimulating, indifferent, depressant or lethal. The causes of underflooding are listed as anthropogenic, natural or combined.--Copyright 1978, Biological Abstracts, Inc.
W79-00612

PRELIMINARY GUIDE TO WETLANDS OF PUERTO RICO, MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Technical Report Y-78-3, April 1978. 77 p, 3 fig, 47 ref, 3 append.

Descriptors: *Wetlands, *Plant populations, *Puerto Rico.

One of a series of eight preliminary guides to the dominant plant associations and communities found in the major wetlands of the United States. The primary purpose is to aid regulatory functions personnel in recognizing and delineating wetlands subject to permit regulation under Section 404 of Public Law 92-500 (Federal Water Pollution Control Act Amendments of 1972). Consists of three parts. An introduction covers the purpose and use of the guidebook as well as general information about Section 404 wetlands. The second part, 'Wetlands of Puerto Rico,' consists of three major sections: Regional Environment, Regional Botanical References, and Wetland Types. The section on regional environment provides a broad context for the more detailed descriptions of the dominant plant associations and communities found in the major wetlands of the region. The nomenclature standard used for the guide is presented in the section on regional botanical references. Description of wetland vegetation is based upon data from the literature and scientists familiar with the region. This section provides a description sufficiently detailed for field use but does not report minor variations of each wetland. The third part contains references to pertinent publications and is specific to the region.
W79-00758

DATA TOWARD THE UNDERSTANDING OF THE HYDROBIOLOGICAL STATUS OF DEAD TRIBUTARY OF THE BODROG NEAR SAROSPATAK: III. FLORA AND FAUNA, (IN GERMAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.

G. Devai , I. Bansci, I. Devai, K. Horvath, and A. Szabo.
Acta Biol Debrecina. 10/11, p 117-128, 1972.

Descriptors: Algae, Bodrog, Ciliata, Cladocera, Copepoda, Dead tributaries, *Hungary, *Hydrobiological studies, Mollusca, Odonata, Rotatoria, Sarospatak, Tributaries, *Aquatic plant, *Aquatic animal, *Oxygen-carbon dioxide budget.

In 2 previous parts of this series, studies on the 2 budget of a backwater and some chemical properties of some waters near river Bodrog (between Sarospatak and Vegardo, NE Hungary) were published. A paper on the environmental conditions of this area was given by Gy. Devai. The present part contains lists of important plant and animal groups (algae flowering plants, Ciliata, Rotatoria, Cladoera, Copepoda, Mollusca and Odonata) partly in order to prepare the 4th part of this series which is going to present a general hydrobiological description of the area.--Copyright 1975, Biological Abstracts, Inc.
W79-00804

HABITAT STRUCTURE AND STREAM FISH COMMUNITIES,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
O. T. Gorman, and J. R. Karr.
Ecology, Vol. 59, No. 3, p 507-515, 1978. 4 fig, 3 tab, 40 ref.

Descriptors: *Habitats, *Aquatic habitats, *Stream beds, *Streamflow, *Niches, Seasonal, Fish populations, Biological communities, Ecology, Adaptation, Streams, Currents(Water), Channels, Channel improvement, *Indiana, Evolution, *Panama, *Species diversity.

Stream habitat complexity is correlated with fish species diversity in selected Indiana and Panama streams. Habitat diversity was measured along 3 dimensions judged important to a wide range of fish groups and applicable to many stream conditions: stream depth, bottom type, and current. Increasing community and habitat diversity followed stream-order gradients. Natural streams supported fish communities of high species diversity which were seasonally more stable than the lower-diversity communities of modified streams. After disturbances such as channelization, seasonal peaks in species diversity attain levels typical of undisturbed streams. Because seasonal changes in stream quality are high, the stability of the fish community is lower in modified than in natural streams. The general correlation between habitat characteristics and presence and absence of fish species suggests that most fishes of small streams are habitat specialists. (EIS-Deal)
W79-00940

THE SUBMERGED VEGETATION OF LAKE PONTCHARTRAIN, LOUISIANA,
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 2L.
W79-00988

2J. Erosion and Sedimentation

SOILS AS A FACTOR IN THE FORMATION OF WATER CHEMICAL COMPOSITION AND BENTHIC COMMUNITIES IN SMALL RIVERS OF THE DESNA BASIN, (IN RUSSIAN),
Inst. Hydrobiol., Acad. Sci. Ukr. SSR Kiev, USSR.
For primary bibliographic entry see Field 2K.
W79-00520

SESTON DYNAMICS AND TRIPTON SEDIMENTATION IN THE PELAGIC ZONE OF A SHALLOW EUTROPHIC LAKE,
Wisconsin Univ.-Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W79-00567

EFFECTS OF PERMAFROST ON STREAM CHANNEL BEHAVIOR IN ARCTIC ALASKA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 2C.
W79-00623

NUMERICAL SIMULATION OF DISSOLVED SILICA IN THE SAN FRANCISCO BAY,
Geological Survey, Menlo Park, CA. Water Resources Div.; and National Oceanographic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorologica Labs.
For primary bibliographic entry see Field 2L.
W79-00635

MANUAL FOR METHODS OF QUICKLY VEGETATING SOILS OF LOW PRODUCTIVITY, CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, MO.
For primary bibliographic entry see Field 4D.
W79-00717

THE ADSORPTION-DESORPTION OF DIURON BY FRESHWATER SEDIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W79-00860

LABORATORY AND FIELD MEASUREMENTS OF UPWELLED RADIANCE AND REFLECTANCE SPECTRA OF SUSPENDED JAMES RIVER SEDIMENTS NEAR HOPEWELL, VIRGINIA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W79-00881

NUMERICAL FLOW MODEL FOR AN ATLANTIC COAST BARRIER ISLAND TIDAL INLET,
North Carolina Univ. at Chapel Hill. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W79-00932

CONTRIBUTION OF NUTRIENTS FROM SEDIMENTS AND INTERSTITIAL WATER TO COLVILLE RIVER SYSTEM, ALASKA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 2K.
W79-00989

IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-00990

THE SHOALING OF BREAKWATER HARBOR, CAPE HENLOPEN AREA, DELAWARE BAY, 1842 TO 1971,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W79-00996

WORKSHOP IN INSTRUMENTATION FOR NEARSHORE PROCESSES. JUNE 16-17, 1977, LA JOLLA, CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 2L.
W79-00997

2K. Chemical Processes

COLORIMETRIC ANALYSIS OF AMMONIA IN WATER,
American Univ., Washington, DC. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-00503

SOILS AS A FACTOR IN THE FORMATION OF WATER CHEMICAL COMPOSITION AND BENTHIC COMMUNITIES IN SMALL RIVERS OF THE DESNA BASIN, (IN RUSSIAN),
Inst. Hydrobiol., Acad. Sci. Ukr. SSR Kiev, USSR.
I. K. Palamarchuk, A. D. Konenko, V. M. Sidorendo, and V. V. Polishchuk.
Gidrobiol Zh 12(4), p 34-42, 1976.

Descriptors: Basins, *Benthic communities, Biomass, *Chemical composition, Flow, Invertebrates, Nutrients, Rivers, Soils, Species, Streams, USSR, *Water pollution, *Bottom sediments, *Desna watershed(USSR).

The soils of watershed area and bottom sediments of small rivers, especially at the periods of minimal streamflow, have an essential effect on the formation of the water's chemical composition, thus determining to a considerable extent the pH values, content of HCO3-, Ca2, Mg2+, NH42- and phosphate ions. Biomass and species composition of the invertebrate benthic organisms depend on the content in the soils of Ca, organic matter and its nutrients.--Copyright 1977, Biological Abstracts, Inc.
W79-00520

EFFECT OF MACROPHYTES ON SOME HYDROCHEMICAL INDICES OF SHALLOW AREAS OF THE KREMENCHUG RESERVOIR (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5A.
W79-00606

THE QUALITY ASSURANCE PROGRAM OF A NATIONAL LABORATORIES SYSTEM,
Geological Survey, Albany, NY. Water Resources Div; and Geological Survey, Reston, VA. Water Resources Div; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W79-00621

GLOBAL DISTRIBUTION OF CARBON DIOXIDE DISCHARGERS, AND MAJOR ZONES OF SEISMICITY,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, El Paso, TX. Water Resources Div.
I. Barnes, W. P. Irwin, and D. E. White.
Geological Survey Water-Resources Investigations 78-39 (open-file report), May 1978. 12 p, 1 plate, 160 ref.

Descriptors: *Earthquakes, *Seismology, *Carbon dioxide, *Volcanoes, Gases, Craters, Geothermal studies, Metamorphic rocks, Geochemistry, Evaluation.

Carbon dioxide discharges of the circum-Pacific belt are in a seismically active zone and in part stem from contact metamorphism. Carbon dioxide discharges in Europe and Asia Minor, also in an area of high seismic activity, are in part from regional metamorphism and are in areas of very high heat flow. (Woodard-USGS)
W79-00637

MAGNETIC RELAXATION STUDY OF WATER MOBILITY IN CLAY MINERALS,
North Dakota Univ., Grand Fork.
For primary bibliographic entry see Field 2G.
W79-00679

DENSITY MAXIMA IN HIGH-PRESSURE SUPERCOOLED WATER AND LIQUID SILICON DIXOIDE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
For primary bibliographic entry see Field 1A.
W79-00864

ISOTHERMAL COMPRESSIBILITY OF SUPERCOOLED WATER AND EVIDENCE FOR A THERMODYNAMIC SINGULARITY AT -45 DEGREES C,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
For primary bibliographic entry see Field 1A.
W79-00866

FIELD CHAMBER MEASUREMENTS OF CO2 FLUX FROM SOIL SURFACE,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
E. T. Kanemasu, W. L. Powers, and J. W. Sij.
Vol. 118, No. 4, p 233-237, 1974. 2 fig, 19 ref.
OWRT A-044-KAN(5), 14-31-0001-3516.

Descriptors: Diffusion, *Carbon dioxide, Chemical analysis, *Soil respiration, Mass flow.

Rates of carbon dioxide exchange were determined using an infrared gas analyzer in an open-chamber system in a field. During 1971 a fan was used to draw air through the chamber; the measured CO2 flux was approximately 40 percent greater than the highest rate reported in the literature. In 1972 two chambers were used: one under slight suction and the other under a slight pressure (compared with atmospheric pressure). The CO2 flux from the soil surface inside the 'pressure' chamber was nearly an order of magnitude lower than inside the 'suction' chamber. Dispersion equations were used to separate mass flow and diffusion components of the total flux. Simplified analysis showed that mass flow could account for the large CO2 flux with slight negative pressures inside the chamber.
W79-00871

NMR INVESTIGATION OF MOBILITY OF WATER SORBED BY CLAY MINERALS,
North Dakota Univ., Grand Forks.
L. J. Laughlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 469, Price codes: A03 in paper copy, A01 in microfiche.
MS Thesis, May 1977. 38 p, 10 fig, 17 ref, append.
OWRT A-051-NDAK(2), 14-34-0001-7072.

Descriptors: Soil moisture, Adsorbed water soil, Physical properties, *Nuclear magnetic resonance, *Clays, Mineralogy, Calcium, Sodium, Soil water movement, *Montomorillonite, Soil analysis.

The mobility of water sorbed in different clay minerals was studied using NMR relaxation times and using diffusion coefficients as measured by pulsed field gradient and radiotracer techniques. In general, T1 and T2 measurements showed an increase in mobility as a function of water content. However, T2 measurements for Ca-Montmorillonite leveled off at 60% water content and slightly decreased beyond 60% moisture level. Diffusion measurements using the pulse gradient method were not possible for the Montmorillonites because of the small values for the relaxation times. But, for Kaolin diffusion measurements were made, using the pulsed gradient technique, at 22 degrees C for all moisture levels and from 0 degrees C to 50 degrees C for 60% water content. The plot of ln D versus 1/T yields a straight line with an activation energy of 1.08 kcal/mole calculated from the slope. For the most part, the radiotracer results were smaller than those obtained by the pulsed gradient method. Noting that the time for diffusion with the pulsed gradient method is 7 msec, while the time for the radiotracer method was several hours, this difference is evidence of restricted self-diffusion for Kaolin. Since the pulse gradient system has a dead time of 4 msec, T2 must be about 6 msec or longer in order to measure the diffusion coefficient using this method.
W79-00910

CONTRIBUTION OF NUTRIENTS FROM SEDIMENTS AND INTERSTITIAL WATER TO COLVILLE RIVER SYSTEM, ALASKA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
C. L. Ho, and H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 392, Price codes: A02 in paper copy, A01 in microfiche. Geografiska Annaler, Vol. 58, Ser. A1-2, p 41-54, 1976. 8 fig, 6 tab, 39 ref.

Descriptors: *Rivers, *Sediments, *Alaska, *Nutrients, Floods, Nitrogen, Phosphorus, Clays, Plankton, Colville River System.

In 1971 water samples and bottom sediments were taken prior to breakup, during breakup, and during summer for nutrient study. The organic content in the sediments was higher in the uper river channel than in the oceans, whereas interstitial nitrogen components showed the opposite trend. Through diffusion and animal activity, some of these components may enter the water column beneath the ice during winter. During the flood period in early spring, interstitial components in the basin sediments are also contributed to river water by leaching. Once flooding begins, river water moves under the sea ice as a wedge. It contains more nutrients than does the seawater beneath it. This floodwater, rich in inorganic nitrogen, provides a basic ingredient for phytoplankton production. During summer, depletion of nutrients prevails as a result of phytoplankton uptake and dilution.(Stihler-Mass)
W79-00989

2L. Estuaries

SURVEY, ECOLOGY, AND SYSTEMATICS OF THE UPPER POTOMAC ESTUARY BIOTA: AUFWUCHS MICROFAUNA, PHASE II,
Georgetown Univ., Washington, DC. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00506

TECHNICAL STUDY ON THE ARTIFICIAL PRECOCIOUS BREEDING OF ABALONE, HALIOTIS DISCUS HANNAI INO, (IN KOREAN),
Tong-Young Fish. Tech. Jr. Coll., Tong-Young, S. Korea.
Y. Kim, and C. Cho.
Bull Korean Fish Soc 9(1), p 61-68, 1976.

Descriptors: *Abalone, *Spawning(Artificial), Environmental effects, *Chungmu Bay(Korea), *Water temperature, *Light, Bays, Asia, *Korea, *Spawning(Abalone).

Effects of changes in environmental parameters, Water temperature and light period, on the induction of spawning were studied. Subtidal specimens of H.d. hanni were collected irregularly 6 times from April-June 1975 in Chungmu Bay near Jukdo Island, the southern coast of Korea. Specimens (150) were reared in 4 aquarium tanks in the laboratory and in a creel submerged in the sea during April 14-June 23, 1975. All groups kept in the 4 tanks and 1 creel showed very high spawning rates (70-100%), compared to those in the natural environment at sea until just before the natural spawning time (0-50%, average 16.4%). The photoenvironment may stimulate secretion of some internal substances, which permits fertilization to induce spawning. For effective breeding, abalones should be reared under controlled conditions with light below 2000 lx even during daytime for more than 60 days before induced spawning.
W79-00515

SOME ASPECTS OF REDOX TRENDS IN THE BOTTOM MUDS OF A MESOTROPHIC BAYOU ESTUARY,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00533

PRELIMINARY GUIDE TO WETLANDS OF THE GULF COASTAL PLAIN, MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-00536

AN OPEN-COAST MATHEMATICAL STORM SURGE MODEL WITH COASTAL FLOODING FOR LOUISIANA; REPORT 1, THEORY AND APPLICATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-00537

MINERAL CYCLING IN SALT MARSH-ESTUARINE ECOSYSTEMS; ECOSYSTEM STRUCTURE, FUNCTION, AND GENERAL COMPARTMENTAL MODEL DESCRIBING MINERAL CYCLES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-00539

GEORGETOWN HARBOR, SOUTH CAROLINA; REPORT 1, HYDRAULIC SALINITY, AND SHOALING VERIFICATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-00540

IMPROVEMENTS FOR MURRELLS INLET SOUTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-00546

PRELIMINARY GUIDE TO WETLANDS OF PENINSULAR FLORIDA; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-00547

PREDICTION OF HEAVY METAL UPTAKE BY MARSH PLANTS BASED ON CHEMICAL EXTRACTION OF HEAVY METALS FROM DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W79-00548

ZONATION OF MARINE GASTROPODS ON A ROCKY INTERTIDAL SHORE IN THE ADMIRALTY GULF, WESTERN AUSTRALIA, WITH EMPHASIS ON THE GENUS NERITA,
Western Australian Museum, Perth.
For primary bibliographic entry see Field 5C.
W79-00555

BIOLOGICAL INTERACTIONS AND THE REALIZED NICHE OF EUPLOTES VANNUS FROM THE SALT MARSH AUFWUCHS,
New York Inst. of Tech., Old Westbury. Dept. of Life Sciences.
For primary bibliographic entry see Field 5C.
W79-00557

LIMNOLOGICAL STUDY OF THE CHICA DE SAN PEDRO, LA POSADA AND LO MENDEZ LAGOONS: I. QUANTITATIVE AND QUALITATIVE ANALYSIS OF WINTER PLANKTON (IN SPANISH),
Concepcion Univ. (Chile). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-00558

STRUCTURAL CHARACTERISTICS OF A DIATOM COMMUNITY EPIPHYTIC ON RUPPIA MARITIMA,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W79-00561

SPECIES DENSITIES OF MACROBENTHOS ASSOCIATED WITH SEAGRASS: A FIELD EXPERIMENTAL STUDY OF PREDATION,
Smithsonian Institution, Fort Pierce, FL.
For primary bibliographic entry see Field 5C.
W79-00564

TRANSPORT LIMITED NUTRIENT UPTAKE RATES IN DITYLUM BRIGHTWELLII,
Johns Hopkins Univ., Baltimore, MD. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-00565

CHANGES IN CARBON AND NITROGEN CONTENT DURING DECOMPOSITION OF THREE MACROPHYTES IN FRESHWATER AND MARINE ENVIRONMENTS,
Oakland Univ., Rochester, MI. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-00571

LIMNOLOGICAL STUDY OF THE CHICA DE SAN PEDRO, LA POSADA AND LO MENDEZ LAGOONS: II. QUANTITATIVE ASPECTS OF WINTER PLANKTON AND ITS RELATION TO PHYSICAL AND CHEMICAL ASPECTS OF THE ENVIRONMENT (IN SPANISH),
Concepcion Univ. (Chile). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-00577

CADMIUM ACCUMULATION BY THE MARINE RED ALGA PORPHYRA UMBILICALIS,
Aberdeen Univ. (Scotland). Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W79-00578

DIFFERENCES IN PRODUCTIVITIES BETWEEN THE GREAT AUSTRALIAN BIGHT AND THE GULF OF CARPENTARIA, AUSTRALIA, IN SUMMER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W79-00579

PARTICULARATE ORGANIC MATTER IN SURFACE WATERS OFF SOUTHERN CALIFORNIA AND ITS RELATIONSHIP TO PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W79-00581

THE CONTINENTAL SHELF AND THE EXCLUSIVE ECONOMIC ZONE: THE PROBLEM OF DELIMITATION AT UNCLOS III,
University of Wales Inst. of Science and Technology, Cardiff. Centre for Marine Law and Policy.
For primary bibliographic entry see Field 6E.
W79-00594

FLORIDA COASTAL ZONE MANAGEMENT: AN ANALYSIS,
For primary bibliographic entry see Field 6E.
W79-00602

WATER RESOURCES OF NORTHEAST NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00631

NUMERICAL SIMULATION OF DISSOLVED SILICA IN THE SAN FRANCISCO BAY,
Geological Survey, Menlo Park, CA. Water Resources Div.; and National Oceanographic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorologica Labs.
D. H. Peterson, J. F. Festa, and T. J. Conomos.
Estuarine and Coastal Marine Sciences, Vol 7, No 2, p 99-116, August 1978. 13 fig, 22 ref.

Descriptors: *Model studies, *Water circulation, *Estuaries, *Dissolved solids, *Silica, Streamflow, Discharge(Water), Tidal effects, Saline water-freshwater interfaces, Mixing, Numerical analysis, California, *San Francisco Bay estuary, *Dissolved silica.

A two-dimensional (vertical) steady-state numerical model that simulates water circulation and dissolved-silica distributions is applied to northern San Francisco Bay. The model (1) describes the strong influence of river inflow on estuarine circulation and, in turn, on the biologically modulated silica concentration, and (2) shows how rates of silica uptake relate to silica supply and mixing rates in modifying a conservative behavior. (Woodard-USGS)
W79-00635

HARBOR AND WATERFRONT DEVELOPMENT PLANNING,
Higher Education Center for Urban Studies, Bridgeport, CT.
H. C. Chung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 685, Price codes: A08 in paper copy, A01 in microfiche. March 1977, 7 fig, 19 charts, 12 tab, 164 p, Report No. UO-LCCM-BRI-77-007. H-2196R.

Descriptors: *Marinas, *Shore protection, *Harbors, *Water pollution, *Water quality, *Planning, *Management, Biological oxygen demand, Docks, Land use, Recreation, Shellfish, Flood damage, Erosion, Sedimentation, Urban planning, *Bridgeport(CT), *Waterfront management, *Waterfront development, *Coastal area management, Urban decay, Waterborne commerce.

This report presents the policy recommendations for the development and management of the harbor and waterfront of the city of Bridgeport, CT. Three models are presented for developing this manageent system: (1) the Harbor and Waterfront Agency (HWA) will function as a coordinator of harbor and waterfront activities and consist of representatives from various public and private agencies; (2) the management function of harbor and waterfront development will be assumed by the Office of Development Administration (ODA); the HWA would be under the jurisdiction of the ODA ad would function primarily as an advisory committee; (3) an independent harbor and waterfront authority with its own staff and budget would be established to devote full time to the task. The report identifies the management functions of this system and analyszes the task for each function. First, the adoption of a participatory planning process called the communicative planning process to ensure adequate planning of harbor development is recommended. This process advocates the full and effective use of the communication media to ensure that the plan would be developed and implemeted in consultation with all those affected. Second, the goals and objectives of the plan should be clearly stated and the means for implementing these measures should be delineated. The goals listed are the improvement of economic productivity; the overall improvement of environmetal quality through conservation; and the improvement of the quality of life of low income groups in waterfront areas. Third, the goals are operationalized and translated into specific policy recommendations for various functional areas of waterfront such as shellfish preservation, enlargement of parks and marinas, flood and storm damage control, water quality and others. An inventory of existing resources and uses in investigated in depth to provide a sound basis for the adoption of these plans.
W79-00657

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT.
National Oceanic and Atmospheric Administration, Washington, DC. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W79-00658

CAPE COD WATER QUALITY MANAGEMENT PLAN.
Massachusetts Water Resources Commission, Westborough. Water Quality Section.
For primary bibliographic entry see Field 5G.
W79-00666

ON TIDAL PROPAGATION IN SHALLOW RIVERS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
P. H. LeBlond.
Journal of Geophysical Research, Vol. 83, No. C9, p 4717-4721, September 20, 1978. 3 fig, 2 tab, 10 ref.

Descriptors: *Tides, *Rivers, *Estuaries, *Model studies, *St. Lawrence River, MAthematical models, Equations, Tides, Tidal waters, Water levels, Time lag, Shallow water, *Tidal propagation, *Fraser River, Shallow rivers, Phase lags.

A reexamination of the momentum balance in shallow rivers, with scaling appropriate to the Saint Lawrence and the Fraser, showed that frictional forces exceed accelerations over most of the tida cycle. Consequently, tidal propagation in shallow rivers was envisaged more properly as a diffusion than as wave propagation phenomenon. The long time lags associated with low waters, unexplainable in terms of a simple wave propagation model, were accounted for easily by an equally simple diffusive model. (Sims-ISWS)
W79-00701

ANALYSES OF AROMATIC HYDROCARBONS IN INTERTIDAL SEDIMENTS RESULTING FROM TWO SPILLS OF NO. 2 FUEL OIL IN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology; and Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-00719

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, RENNIE ISLAND MARSH DEVELOPMENT SITE GRAYS HARBOR, WASHINGTON, SUMMARY REPORT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. K. Vincent.
Technical Report D-78-11, April 1978. 94 p, 6 fig, 21 ref, 4 append.

Descriptors: *Habitats, *Marsh management, *Salt marshes, On-site investigations, *Grays Harbor(Wash), *Rennie Island(Wash), Washington.

A salt marsh development project originally planned for Rennie Island in Grays Harbor, Washington, was terminated after a detailed baseline analysis. These studies indicated that extremely high wave energy conditions at the site would make marsh development infeasible without a substantial protective and retaining structure. Foundation analyses indicated a weak, unstable condition that made a conventional rock or earthen dike unsuitable. An evaluation of various alternative structures revealed that no economically feasible options were available, so the marsh development project was terminated. (WES)
W79-00754

ZOOPLANKTON OF THE REGION OF NOSY-BE: V. CLADOCERA: CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 5C.
W79-00809

ZOOPLANKTON OF THE NOSY-BE REGION: VII. SPATIAL-TEMPORAL DISTRIBUTION OF THE GENUS LUCIFER (DECAPODES SERGESTIDAE) IN THE PROVINCE NERITIQUE, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceaographique (ORSTOM) de Nosy-Be.
D. Petit.
Cah O R S T O M Ser Oceanogr. 11(3), p 373-385, 1973.

Descriptors: Decapods, *Distribution, Drift, *Estuaries, Genus(Lucifer), Lucifer-chacei, Lucifer-hanseni, Lucifer-penicillifer, Lucifer-Typus, Malagasy-republic, Neritique, Nosy-Be, Plankton, Province, Rainy, Season, Sergestidae, *Spatial distribution, *Temporal distribution, Trophic levels, *Zooplankton.

Four species, L. typus, L. penicillifer, L. chacei and L. hanseni are collected seasonally in neritic waters. They are divided into 2 groups: L. typus, oceanic; and L. penicillifer, L. chacei and L. hansemi, in order of their increasing neritic habitat. L. penicillifer and L. chacei are found on the continental shelf during the rainy season; L. hanseni, inner neritic, is collected in the outer neritic area when the estuary waters drift. The station nearest the shore is the richest in neritic species. These are driven back on the coast in the dry season, when L. typus is found on the continental shelf. L. penicillifer shows a more definite seasonal cycle than L. chacei. Breeding is continuous at the inshore station. Trophic factors restrict abundance in the rainy season. (See also W77-02416) Copyright 1975, Biological Abstracts, Inc.
W79-00848

DOMES UPPER WATER PHYSICAL OCEANOGRAPHY, A COMPONENT OF THE DOMES PROGRAM,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W79-00885

DISTRIBUTION AND COMPOSITION OF THE SUSPENDED PARTICULATE MATTER IN THE WATERS OF THE DOMES REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W79-00886

TRACE METAL BASELINES IN THE DOMES STUDY AREA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-00887

THE MESA PUGET SOUND PROJECT, SEATTLE, WASHINGTON. FY76-ANNUAL REPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
MESA Annual Report for FY76, February 1978, 19 p, 1 fig, 9 ref.

Descriptors: *Baseline studies, *Water quality control, *Resources development, *Pollution abatement, Waste water, Washington, *Puget Sound Project(Wash), Annual report, Flushing time.

During FY76 and 76T (Fiscal Transitional Quarter-July through September 1976), the energy-related activities have constituted the major effort of the project. MESA (NOAA) funds have been used for water-quality studies of the central basin of Puget Sound, for purchase of oceanographic hardware and instrumentation, and for administration and scientific management of the petroleum and wastewater field efforts. Research tasks undertaken for the energy-related project were based upon: the need to obtain baseline data prior to potential increases in contaminant level; the complexity and time required by the study; funding limitations; and the timing requirements of resource managers. Therefore, during the first year, research resources were primarily expended upon baseline and transport studies. The wastewater studies focused on identification of the scope of potential wastewater problems in the central basin of Puget Sound. The major effort, an investigation into the flushing time of the central basin, indicated the possibility of surprisingly short flushing times, under certain oceanographic and atmospheric conditions, however the water quality surveys found that certain of the shallow southern basins were subject to poor water quality, probably due to dinoflagellate blooms. (NOAA)
W79-00888

MISSISSIPPI WETLANDS PROTECTION PRACTICE AND PROCEDURE.
Mississippi Univ. Law Center, University.
For primary bibliographic entry see Field 6E.
W79-00927

DISTRIBUTION AND ABUNDANCE OF BENTHIC MACROFAUNA IN THE SEWAGE SLUDGE DISPOSAL AREA, NEW YORK BIGHT APEX, FEBRUARY 1975,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W79-00930

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK-NEW JERSEY OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W79-00931

NUMERICAL FLOW MODEL FOR AN ATLANTIC COAST BARRIER ISLAND TIDAL INLET,
North Carolina Univ. at Chapel Hill. Center for Marine and Coastal Studies.
T. C. Gopalakrishnan, and J. L. Machemehl.
Sea Grant Publication No. UNC-SG-78-02, April 1978. 60 p, 17 fig, 3 tab, 8 ref, 5 append. Also as NC Center for Marine and Coastal Studies Publication No. 78-1. SG-04-6-158-44054.

Descriptors: *Barrier Islands, *Inlets(Waterways), *Flow measurement, *North Carolina, Tidal waters, *Mathematical models, Model studies, U.S. East Coast.

A numerical model for computation of flow in inlets with junction is developed. The Galerkin techinque is coupled with a finite element analysis in the flow model. The vertically integrated equations of momentum and mass conservation are used with appropriate boundary and initial conditions. The junction conditions are introduced by the time rates of charge of energy and mass flux at the junction. A 'double sweep' approach is used in solving for the dynamics of flow. A parabolic shape function is adopted in the model to satisfy the requirement of linear independence. The numerical flow model is verified with field data for Carolina Beach Inlet, North Carolina. The tidal fluctuations in the inlet gorge and tidal velocities in the Atlantic Intracoastal Waterway were used as initial and boundary conditions respectively. The tidal velocities in the inlet gorge and tidal fluctuations in the Atlantic Intracoastal Waterway were computed with the numerical simulation flow model and compared with field data. The Galerkin finite element flow model performed well considering the complex nature of flow in a tidal inlet. (NOAA)
W79-00932

TIDAL AFFECTED DISTRIBUTIONS OF SURFACE CHLOROPHYLL AND TRANSPARENCY IN THE NEW YORK BIGHT,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5B.
W79-00933

FLOWS OF MATERIALS BETWEEN POORLY FLOODED TIDAL MARSHES AND ESTUARY,
Maryland Univ. Solomons, Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W79-00987

THE SUBMERGED VEGETATION OF LAKE PONTCHARTRAIN, LOUISIANA,
Army Engineer District, New Orleans, LA.
G. N. Montz.
Castanea, Vol. 43, No. 2, p 115-128, June, 1978. 6 fig, 1 tab, 9 ref.

Descriptors: *Submerged plants, *Louisiana, *Surveys, *Spillways, Aquatic plants, Rooted aquatic plants, Wetlands, Lakes, Discharge, Effects, *Lake Pontchartrain(LA).

The submerged vegetation was surveyed before and after the April 1973 opening of Bonnet Carre' Spillway. Abundant species were Vallisneria americana, ruppia maritima, and Najas guadalupensis. The study revealed approximately 2,000 acres of water-bottom covered with submenrged vegetation, the greatest potion o fwhich was recorded between Green point near Mandeville, and Big Point near Slidell, along the north-eastern shoreline of the lake. The release of fresh river water did not have observable effects on the submerged vegetation.(Stihler-Mass)
W79-00988

REPORT ON FY 1977 NUMERICAL MODELING IN PUGET SOUND,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W79-00992

A STUDY OF THE SOURCES, TRANSPORT, AND REACTIONS OF SUSPENDED PARTICLES IN WATERS OF THE NEW YORK BIGHT,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-00993

THE SHOALING OF BREAKWATER HARBOR, CAPE HENLOPEN AREA, DELAWARE BAY, 1842 TO 1971,
Delaware Univ., Newark. Coll. of Marine Studies.
J. M. Demarest, II.
Sea Grant Report No. DEL-SG-1-78, 1978 181 p, 29 fig, 3 tab, 32 ref, 2 append.

Descriptors: *Delaware, *Shoals, *Sedimentation, Harbors, Cape Henlopen(Del), *Delaware Bay.

The sedimentary processes in the breadwater Harbor-Cape Henlopen area were investigated. Toward this end, Shoaling rates, Changes in the pattern of shoaling with time, and shoreline changes were determined through bathymetric comparison, using survey data starting with the 1842 U.S. coastal survey map. In addition, information about modern conditions and processes in the study area were obtained through the determination of sediment distributions within the harbor and on the tidal flat, and by measurement of currents in two locations in the harbor. From the data thus obtained, the sedimentary processes responsible for the filling of the harbor and the effects of man-made structures on normal marine processes can be better understood. Therefore, data is presented for prediction of the future of Breakwater Harbor from a geologic viewpoint and for planning of the future of the harbor from a political-economical viewpoint. (NOAA)
W79-00996

WORKSHOP IN INSTRUMENTATION FOR NEARSHORE PROCESSES. JUNE 16-17, 1977, LA JOLLA, CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. J. Seymour.
Sea Grant College Program Publication No. 62, IMR Reference No. 78-102, (1978). 197 p, numerous fig, tab, ref.

Descriptors: *Sediment transport, *Instrumentation, *Conferences, *Nearshore processes.

This compilation of workshop papers are grouped in order of their primary objectives. The objectives were to: (1) determine the present capabilities for measuring and recording nearshore parameters related to sediment transport; (2) determine the specific needs of the Nearshore Sediment Transport Study for instrumentation; and (3) discover areas requiring further development to meet the needs of the Nearshore Sediment Transport Study. (NOAA).
W79-00997

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME I.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W79-00998

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W79-00999

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

A PROCESS AND PILOT PLANT DESIGN STUDY OF THE ABSORPTION FREEZING VAPOR COMPRESSION PROCESS.
Concentration Specialists, Inc., Andover, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 276, Price codes: A07 in paper copy, A01 in microfiche. Final Report, (OWRT/S-78/2), December 1977, 77 p, 30 fig, 9 tab, append. 14-34-0001-7530.

Descriptors: *Desalination apparatus, *Absorption Freezing Vapor Compression, *Desalination, *Waste water treatment, *Separation techniques, *Freezing, *Water purification, Pilot plants, Systems analysis, Technology, Engineering, Design, Heat pumps, Costs, Cost comparisons.

A design study of the Absorption Freezing Vapor Compression (AFVC) process for desalination and other concentration/separation treatments of waste water was conducted. The AFVC process overcomes one of the major problem areas in previous freezing processes by using a closed cycle refrigerant loop to power the absorption cycle, thus eliminating compressor problems caused by direct compression of refrigerants contaminated with sea water. The process maintains low energy requirements with absorption cycle powered by a heat pump. Power consumption of 42 and 38 kw-hr/1000 gal were calculated for 100,000 and 1 million gpd plants respectively. A 25,000 gpf pilot plant was designed which consists of three major process vessels: freezer/absorber; wash column/melter and generator; and equipment skids, one for refrigeration equipment and one for pumps, air removal equipment, and heat exchangers. Capital and operating costs were calculated for 100,000 gpd and 1 million gpd plants as well as for the pilot plant. The major advantages of the AFVC process are summarized: (1) low power consumption of freezing compared to heat processes, which is especially important in view of rising fuel costs; (2) less corrosion using epoxy coated mild steel and aluminum which are not completely suitable for evaporative process plants and are often replaced by more costly titanium in heat processes; (3) no pretreatment is needed to prevent scaling even with brackish water saturated with calcium sulfate. (Majtenyi-IPA)
W79-00507

IMPACT OF ENERGY DEVELOPMENT ON COLORADO RIVER WATER QUALITY,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-00605

VAPOR COMPRESSION VERTICAL TUBE FOAM EVAPORATION,
California Univ., Berkeley. Seawater Conversion Lab.
H. H. Sephton.
Desalination, No. 23, p 299-310, 1977, 2 fig, 5 tab, 13 ref. (California Water Resources Center Project S-174).

Descriptors: *Evaporators, *Desalination apparatus, *Heat transfer, *Desalination, *Water reuse, *Economic feasibility.

Vertical tube foam evaporation (VTFE) has been shown to provide a 4- to 6-fold increase in the evaporation-side heat transfer coefficient, and evaporator performance enhancements ranging from 50 to 200 percent for downflow and upflow vertical tube evaporators using double-fluted aluminum-brass distillation tubes. This process relies upon the addition of 1 - 20 parts per million of a selected surfactant to the feed, and imposition of foamy two-phase vapor-liquid flow over the heat transfer surfaces. Recent data obtained with a new 5000 US gpd VTFE pilot plant operated by the vapor compression (VC) technique is reported, showing the promise of applying this technology to seawater conversion and water reuse, in comparison with a conventional VC-VTE operation. Test data include overall heat transfer coefficients obtained on several typical saline waters, showing that substantial capital cost and energy reductions are obtainable with VTFE. Capital costs are reduced as a consequence of the lower heat transfer surface area required by VTFE, and energy cost reductions follow from a reduction in the delta T and VC compression ratio provided by VTFE. (Snyder-Calif)
W79-00680

THE PROBLEM OF WATER,
Weizmann Inst. of Science, Rehovoth (Israel).
For primary bibliographic entry see Field 3B.
W79-00795

SUPPLYING THE ISLAND OF FUERTEVENTURA WITH SEA WATER (ABASTECIMIENTO A LA ISLA DE FUERTEVENTURA CON AGUAS PROCEDENTES DEL MAR),
Ministerio de Obras Publicas, Barcelona (Spain).
F. Troyano Lobaton, R. Abadal Torruella, E. Baeza Benito, and C. Castaneyra Medina.
Agua, No. 81, p 12-24, Nov.-Dec. 1973. 6 fig.

Descriptors: *Desalinization plants, *Water supply, *Water sources, Costs, Fuerteventura, Canary Islands, Spain.

Fuerteventura is the most arid of the Canary Islands and its economic development had been restrained by an extremely scarce water supply. Prior to 1977, water was provided from wells with high levels of salinity. Surface water resouces are too scarce to provide and adequate supply. The desalinization of sea water was the only alternative that could substantially increase the water supply. A desalinization plant was constructed and began to operatin in 1977, permitting the island to expand its tourist industry. High costs are the major problem with this method of water supply the financial responsibility for further expansion of the supply should rest upon the water users. (Russell-Arizona)
W79-00801

GEOTHERMAL ACTUATED METHOD OF PRODUCING FRESH WATER AND ELECTRIC POWER,
J. M. Edmondson, and M. H. Smoot.
U.S. Patent No. 4,091,623, 9 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1654, May 30, 1978.

Descriptors: *Patents, *Geothermal studies, *Potable water, Water treatment, Condensation, Equipment, Heat exchangers, Electric power production, California, Saline water, Salton Sea(CA).

The salt content of water in the Salton Sea has increased in recent years to a level that is highly detrimental to marine life. By use of the invention, the Salton Sea may be reclaimed as a desirable environment for marine life. The method may be carried out by sequentially withdrawing water from the Salton Sea, distilling a portion of the withdrawn water by utilizing heat from the nearby geothermal sources, returning fresh potable distilled water to the Salton Sea, saline water to the geothermal reservoir, and concurrently generating electric power as the operation is carried out. A bore hole is formed in the earth adjacent a natural body of saline water such as the Salton Sea. The bore hole has pressurized mineral-containing fluid discharging at a temperature of greater than 212 degrees F. A closed reservoir is provided to which saline water can flow, preferably by gravity. Pressurized fluid from the geothermal source has a sufficient heat content that it tends to flash into steam when discharged into the reservoir under reduced pressure. The partially condensed steam and condensate flows to a heat exchange where condensation of steam to water is completed. In another form of the invention steam discharging from the closed reservoir is used to transform a low boiling point liquid to pressurized vapor that is used to drive a gas turbine that is connected to an electric generator. (Sinha-OEIS)
W79-00826

THERMAL POWER STATION COMBINED WITH A PLANT FOR SEAWATER DESALINATION,
Brown, Boveri and Co. Ltd., Baden (Switzerland). (Assignee).
H. Pfenninger.
U.S. Patent No. 4,094,747, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, No. 2, p 680, June 13, 1978.

Descriptors: *Patents, *Desalination, *Water purification, Sea water, Heat exchangers, Condensation, Distillation, Thermal power plants, Turbines, Steam turbines, Gas turbines.

The object of the invention is to utilize economically the exhaust heat of a gas turbine while retaining the good efficiency of the gas turbine, to which is connected a heat exchanger for supplying heat to a seawater desalination plant. This object is achieved in that the heat exchanger is in the form of a waste heat boiler with, on the water side, two separate sections of which that section utilizing the high exhaust gas temperatures is used to generate steam for a steam turbine, and the second section constitutes directly or indirectly the heat source for the seawater desalination plant. An improvement in overall thermal efficiency is obtained by combining the gas turbine with a steam turbine. The exhaust gas outlet temperatures from the section of the boiler used to generate steam for the steam turbine are about 180-200C, which allows an optimum configuration for the entire steam section. The temperature difference between the two flow media in the steam-generating section of the boiler can then be chosen more favorably. The lower exhaust gas temperatures after the first boiler section are also very well suited to the second boiler section, which is used to generate high-temperature hot water for the desalination plant or to heat the seawater directly. (Sinha-OEIS)
W79-00846

A METHOD OF USING IRRIGATION DRAINAGE WATER FOR POWER PLANT COOLING,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 5D.
W79-00862

UNIVERSITY OF CALIFORNIA SALINE WATER CONVERSION RESEARCH.
California Univ., Berkeley. Sea Water Conversion Lab., and California Univ., Los Angeles. School of Engineering and Applied Science.
Progress Report, July 1, 1975-June 30, 1976. Water Resources Center Desalination Report No 63, 75 p.

Descriptors: *Desalination processes, *Saline water conversion, *Wastewater disposal, Ion exchange, Membrane processes, Electrodialysis, Reverse osmosis, Foam fractionation, Solar distillation, Geothermal distillation, Saline water, Wastewater treatment, Foamy-flow vertical tube evaporator, Scale control.

This report covers 1975-1976 fiscal year activities of the University's desalination program funded through the University of California Water Resources Center, and indicates related activities funded by other agencies. It is a compilation of synopses of ongoing research at two Californian universities, Berkeley and Los Angeles. Research topics at Berkeley include distillation studies using solar or geothermal energy, foam fractionation and flotation studies, membrane processes, ion exchange, and other subjects. Reported activities at Los Angeles are saline water demineralization by means of a semipermeable membrane, corrosion of metals and alloys in seawater, scale control studies and others. Each synopsis lists the study staff, briefly describes the up to date activities in each topic category, and lists study publications and other relevant references. Appendices list personnel, publications, reports, and theses. (Coan-NC)
W79-00875

PREPARATION OF ION-EXCHANGE MEMBRANES WITH EXTREMELY LOW AREAL RESISTANCES.
Southern Research Inst., Birmingham, AL.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-288 391, Price codes: A01 in paper copy, A01 in microfiche. Report OWRT/S--78/6, Final Report No. SoRI-EAS-78-303, June 6, 1978. 49 p, 1 fig, 11 tab, 14 ref. 14-34-0001-7518.

Descriptors: *Desalination, *Membrane processes, *Water purification, *Cation exchange, *Anion exchange, Separation techniques, Ion exchange, Saline water, Water quality control, Areal resistance, Polymers, Research and development, Saline water, Desalination apparatus, Water quality control.

Methods of preparing cation- and anion-exchange membranes with low areal resistances were developed for use in lower cost desalination of sea water. Membranes of both types were prepared having the desired resistance of 1 ohm-sq cm or less. Preparation involved using reinforcements to strengthen polymer compositions which had low resistances and acceptable selectivities, but which were weak and dimensionally unstable. The reinforcing materials were non-woven fabrics with high void volumes. In 1 N sodium chloride (NaCl) the best experimental cation-exchange membranes that could be made consistently had transference numbers of 0.76 to 0.79, compared to commercial membranes with a range of about 0.85 to 0.87. The best experimental anion-exchange membranes had transference numbers of 0.90, the same as commercially available membranes. It is recommended that further work is needed on cation-exchange membranes to improve transference numbers and prepare thinner (about 6-mil) membranes. With anion-exchange membranes already having acceptable transference numbers, it is recommended that thinner membranes should be prepared and evaluated at various temperatures. (Majtenyi-IPA)
W79-00904

RESEARCH ON IN SITU-FORMED CONDENSATION POLYMER FOR REVERSE OSMOSIS MEMBRANES,
Midwest Research Inst., Minnetonka, MN. North Star Div.
J. E. Cadotte, M. J. Steuck, and R. J. Petersen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 387, Price codes: A05 in paper copy, A01 in microfiche. Final Report OWRT/S--78/8, March 1978. 47 p, 1 fig, 14 tab, 8 ref. 14-34-001-6521.

Descriptors: *Desalination, *Desalination processes, *Reverse osmosis, *Membrane processes, Water purification, Polymers, Polypiperazineamides, Crosslinking, Polysulfone-sulfonic acids, Vinyl polymers, Acrylic polymers, Research and development, Saline water, Desalination apparatus, Polymerization, Chemical reactions, Water quality control.

Development of chlorine-resistant reverse osmosis membranes for use in desalinization of sea water was carried out using in situ formation of a thin, dense coating on a microporous support. Three types of polymer systems were studied: polypiperazineamide membranes formed by interfacial deposition, membranes formed by crosslinking, water-soluble polysulfone-sulfonic acids in situ, and linear vinyl or acrylic polymer membranes crosslinked in situ by chemical reactions or ultraviolet radiation. Most promising results were obtained with polypiperazineamide membranes which were prepared with fluxes of 20 to 28 gfd at a salt rejection of about 98%, tested at 1500 psig in 3.5% synthetic sea water. One variation of this method produced a membrane with salt rejection of 99.3%. A second variation still under investigation gives good chlorine resistance, extremely high flux, and good rejection of polyvalent ions but is not able to perform acceptably in rejecting monovalent ions. Polysulfone-sulfonic acid membranes were chlorine resistant but salt-rejections above 90% could not be obtained. Vinyl and acrylic polymers crosslinked on microporous polysulfone supports gave low fluxes in general unless severe crosslinking reactions were used and these often introduced chlroine sensitivity. (Majtenyi-IPA)
W79-00907

3B. Water Yield Improvement

THE PROBLEM OF WATER,
Weizmann Inst. of Science, Rehovoth (Israel).
Yosef Ben Mordechai.
Rehouot, Vol. 8, No. 1, Spring 1976, p 20-24.

Descriptors: *Water resources development, *Water policy, *Water management(Applied), Water distribution(Applied), Desalination, Hydrography mapping, Pollutants, Water reuse, Brackish waters, Forecasting, *Israel.

Because Israel is a semi-arid country, an intelligent water policy is a necessity for survival of the state. It is required that this policy be based upon an estimation of present and future needs, proper management and distribution systems, waste water usagy, desalination, and mapping of resoures. Accordingly, these problems are presently receiving priority sdtatus by the major research centers: The Weismann Institute, the Technion, the Hebrew university, and the Negev Research Institute. The Academic community is

attacking the probelm on two fronts: (1) mapping water supplies including the identification of the various polluting elements, and (2) developing techniques for either the reusage of wastewaters or for generating potable water from the sea or inland brackish sources. Moedern approaches ad techniques being investigated are reviewed here with emphasis placed upon the particular needs of this rapidly developing country. (Tckes-Arizona)
W79-00795

DESERTIFICATION AND TECHNOLOGICAL ADJUSTMENT IN THE MURRAY MALLEE OF SOUTH AUSTRALIA,
Oxford Univ. (England). School of Geography.
M. Williams.

Descriptors: *Deserts, *Australia, *Desertification, *Arid lands, Agricultural engineering, Environmental engineering, Manpower, Mechanical equipment, Transportation, Erosion control, Droughts, Biological components, Land tenure, Grazing, Economic justification, Economic feasibility, Range management, Grasses, Legumes, Land management, Land use, Social aspects, Social effects, Social participation.

Farming has been practiced in Murray mallee in southern Australia since before the beginning of this century. Although once productive and successful, economic decline, poor management and drought since 1930 have turned the 26,000 Km2 area into a badly eroded marginal area. Attempts at rejuvenation of this deteriorated region constitute a broad-based attack including alteration of the structural framework of farming, improvement of the biological components and alteration of the mechanical and technological basis. Under the 'Marginal Lands Scheme' the director of agriculture has reduced the number of land holdings by half and reduced cropping to one year in three or four on any given piece of land with the fallow years being used for sheep grazing. The consequent increase in the average size of land holding has created more economically and environmentally viable working units. Biologically, new grass and leguminous pastures have replaced the previously widespread sowing of grains and have provided the needed diversification to stabilize the region. Mechanically, the adoption of tractors since the 1950's has increased the area per worker without reducing the total number of workers. As holdings have become larger and more fragmented the farmer and his family have been required to make the necessary social and economic adjustment. Further travel is necessary to reach both work and services, local services are more costly and sparse, population declines, and people move to the urban areas. Despite these adjustments, rainfall uncertainty and potential desertification remain as factors to be coped with. (Tickes-Arizona)
W79-00807

FEASIBILITY OF RAINWATER COLLECTION SYSTEMS IN CALIFORNIA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
D. Jenkins, and F. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 378, Price codes: A04 in paper copy, A01 in microfiche. Technical Completion Report, Contribution No. 173, California Water Resources Center, August 1978, 55 p, 52 fig, 18 tab, 10 ref. (California Water Resources Center Project UCAL-WRC-W-539).

Descriptors: *Rain water, *Water sources, *Water supply, *Rain, Domestic water, Feasibility studies, *California, *Rainwater collection systems, Collection systems, Rainfall, *Alternative water use, Water treatment, Estimating.

The northern California drought of 1975-77 emphasized the need to explore alternatives for water supply. This research examined the feasibility of collecting rainwater for domestic consumption from roof areas into storage tanks. Rainfall records for 13 representative California locations were analyzed to provide a basis for estimating the supply of water from rainwater collection systems. Standard statistical measures of central tendency, distribution and variation, as well as serial correlation, were remarkably consistent. A single relationship emerged which expressed the yield of rainwater supply systems for all locations in terms of annual rainfall, collection area, and storage tank capacity for different levels of system reliability. Because of the high cost of the large storage tank needed for a completely reliable rainwater supply system to sustain even a minimal domestic demand, the most economical supply system will generally involve use of rainwater during the wet season, supplemented from other sources during dry periods. The concentration of lead in rainwater near urban areas frequently exceeds the recommended limit for drinking water, which would imply that rainwater supply systems are feasible only in rural areas. Microbiological contamination of rainwater results from bird droppings on the collection area, but chlorine disinfection proved effective. Turbidity can be removed to below the limit recommended for drinking water by a process of alum coagulation and settlement, feasible on a household scale. (Snyder-Calif, Davis)
W79-00855

WATER CONSERVATION INFORMATION DISSEMINATION DURING 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
L. D. James, and W. H. Andrews.
Utah Water Research Laboratory, Water Resources Planning Series Report P-78-002, June 1978, 235 p, 27 tab, 3 append. OWRT T-0021 (7706)(1).

Descriptors: *Droughts, *Water conservation, Range management, *Water harvesting, Water reuse, Groundwater mining, Irrigation, Erosion, *Information exchange, *Information dissemination, Water distribution(Applied), Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

As drought conditions in 1976 and 1977 became increasingly severe throughout the west and affected many other parts of the country, many states began special drought information dissemination efforts. This study was organized to provide a forum for the exchange of information among the respective states that could reduce duplication among independent efforts. The project collected information on: (A) Water-user conservation practices, (1) domestic use, (a) inside use, (b) outside use, (2) industrial, (3) commercial, and (4) irrigation; (B) Water-supplier management practices, (1) water conservation inducements, (2) emergency supply augmentation, (a) groundwater mining, (b) water harvesting, (c) water reuse, (3) reallocation among uses or users; (C) special drought problems, (1) livestock and range management, (2) effects on fish and wildlife, (3) fire danger, (4) effects on recreation, (5) energy effects (reduced generation and additional use), (6) effects of resulting changes in water quality including salinity, and (7) wind erosion. Types of information included (1) research results contributing to dealing more effectively with emergency drought situations, (2) research currently underway, (3) brochures or other material prepared for public distribution, (4) reports of extension agents or other technical personnel working with the public to solve drought problems, and (5) user or expert statements recommending supplementing or revising any of the above. This report contains 667 abstracts and a snythesis of the information obtained on each topic.
W79-01000

3C. Use Of Water Of Impaired Quality

ANTIVIRAL SUBSTANCES FROM CALIFORNIA MARINE ALGAE,
California Univ., Berkeley. Naval Biosciences Lab.
D. W. Ehresmann, E. F. Deig, M. T. Hatch, L. H. DiSalvo, and N. A. Vedros.
Journal of Phycology, Vol. 13, 1977, p 37-40. 2 tab, 14 ref. Sea Grant R/MP-12.

Descriptors: *Viruses, *Viricides, *Rhodphyta, *Algae, *Herpes simplex, *Coxsackie B5, Marine algae, Seaweeds, California, Coasts, Intertidal areas, Constantinea simplex, Polysaccharides, Farlowia mollis, Human diseases, Diseases, Public health.

Extracts of 28 species of intertidal marine macroscopic algae collected during low tide between 1971-75 in various northern California coastal habitats were examined for pharmacological activity against 12 mammalian viruses. The algae represented Chlorophyta, Phaeophyta, and Rhodophyta. Ten rhodophytes (red algae) contained substances which caused greater than a two-log reduction in infectivity of Herpres simplex virus types 1 and 2: Constantinea simplex, Cryptosiphonia woodii, Endocladia muricata, Farlowia mollis, F. crassa, F. compressa, Pikea pinnata, Leptocladia conferta, Cryptopleura violacea, and Nienburgia andersoniana. Constantinea simplex agent in extracts from C. simplex and Farlowia mollis was determined to be a structural polysaccharide on the basis of physical and chemical properties. Many of the active algae were members of the family Dumontiaceae (Cryptonemiales). Algal species which exhibited no antiviral activity by the methods used were: Ulva lactuca, Egregia menziesii, Cystoseira osmundacea, Fucus furcatus, Pelvetia fastigiata, Porphyra lanceolata, Calliarthron setchelliae, Corallina gracilis, Prionitis lanceolata, P. linearis, Agardhiella coulteri, Gigartinia canaliculata, Iridaea flaccida, I. heterocarpum, Halosaccion glandiforme, Rhodymenia lobulifera, Laurencia spectabilis, and Rhodomela larix. This study represents the first published survey of marine macroscopic algae for antiviral substances. (Lynch-Wisconsin)
W79-00590

SALINISATION IN THE SOUTHWEST OF WESTERN AUSTRALIA,
Western Australia Dept. of Conservation and Environment, Perth.
M. J. Mulcahy.
SEARCH, Vol 9, No 7 p 269-272, July 1978. 2 fig, 28 ref.

Descriptors: *Australia, *Laterites, *Salinization, *Vegetation effects, *Land management, Saline water, Saline soils, Pasture management, Environmental effects, Evaporation, Groundwater recharge, Water conservation, Water quality, Water pollution sources, Soil contamination, Drainage practices, Geomorphology.

Salinisation in the southwestern region of Western Australia is a problem caused largely by the replacement of indigenous deep-rooted vegetation with shallow-rooted crop ad pasture plants. The effect of clearing these areas for the sowing of selected agricultural crops has been a decrease in the amount of water lost by evapotranspiration ad the consequent increase in the volume of water available for groundwater recharge, discharge into streams, and for movement overland or at shallow depths beneath the soil surface. High soil and groundwater salt concentrations result. Variable landscape zonation in Western Australia is a cause for different levels of response or suseptibilities to these problems. Zones of dissected laterities, bauxitic laterities and lateritic sand plainsand salt

lakes are anayzed separately and an association is found between laterization of shield rock and degree of salinization present. With the exception of Kangaroo Island in southern Australia, salinisation does not apppear to be a major hazard on lateritic landscapes. (Tickes-Arizona).
W79-00803

MANAGEMENT OF BRACKISH WATERS IN ARID LAND AGRICULTURE: MODERN EXPERIENCES WITH ANCIENT PROBLEMS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
M. Twersky.
Arid Lands Newsletter, No. 4, p 1-7, October 1976. 6 fig, 4 tab, 48 ref.

Descriptors: *Brackish water, *Arid lands, *Irrigation practices, Economic feasibility, Soil contamination, Water pollution sources, Soil-water-plant relationships, Water quality, Salinity, Flood irrigation, Trickle irrigation, Sprinkler irrigation, Management, Land management, Irrigation techniques, Israel.

The recent development of brackish water irrigation technologies are making it economically and physically possible to farm the arid and semi arid regions of the world. Proper use of brackish waters requires a thorough knowledge of soil and crop vulnerability to the various water and soil pollutants indigenous to the area of application. Accordingly, this author reviews the water quality and salinity criteria necessary to use marginal water supplies. A brief discussion of surface (flooding, furrow and sprinkler) sprinkler and trickle irrigation is presented with a discussion of the adaptive techniques and problems of each. Aiding the modern farmer in the utilization of these techniques is the development of management concepts and tools such as more accurate salinity measurement indicators, automatic irrigation control systems, high frequency irrigation techniques, means of optimizing chemical and fertilized application, and advances in the selection of varieties with higher genetic potential. (Tickes-Arizona)
W79-00810

WATERLOGGING AND SALINISATION IN IRRIGATED SEMI-ARID REGIONS OF NSW,
S. Pels.
SEARCH, Vol. 9, No. 7, p 273-276, July 1978. 2 fig.

Descriptors: *Saline water, *Drainage systems, *Australia, *Salinity, Brackish water, Saline water systems, Water pollution sources, Saline water intrusion, Seepage, Mixing, Chemical properties, Drainage practices, Tile drains, Tubewell drains, Salt water movement, Leaching, Water table, Waterlogging, Arid lands.

Irrigation, required in desert regions to practice agriculture, must be carefully managed to avoid salination and waterlogging and the consequent destruction of productive land. Salinisation and poor drainage are inherent problems in western New South Wales where subsoil and groundwater salinities are high. The addition of water through irrigation causes an imbalance in the hydrological equilibrium present in these desert areas and proper drainage schemes must be found to allow for leaching of imported salts and to reduce the occurrence of high water tables and waterlogging. Four case studies are presented: the Wakool irrigation district, the Curlwaa irrigation area, the Mildura Weir and the Reverine plains, to illustrate both causes and remedies for these problems. The use of tile and tubewell drainage techniques as well as the multiple use of irrigation and drainage waters are explained and illustrated. In areas where salt levels are particularly high, drainage waters must be conveyed to inland regions for evaporation. Problems such as these exist in many arid regions and semi arid regions throughout the world and through investigation followed by ameliorative measures are required to avoid widespread desertification and destruction of productive land. (Tickes-Arizona)
W79-00812

3D. Conservation In Domestic and Municipal Use

STATISTICAL AND STOCHASTIC ANALYSES OF SYNTHETICALLY GENERATED URBAN STORM DRAINAGE QUANTITY AND QUALITY DATA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W79-00521

DEVELOPMENT OF COMPUTER PROGRAM FOR LINEARIZED SUBHYDROGRAPHS METHOD FOR URBAN RUNOFF DETERMINATION,
Akron Univ., OH. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W79-00526

ENVIRONMENTAL QUALITY EXPENDITURE PATTERNS AND URBAN LOCATION: EFFECTS ON INCOME GROUPS,
Ottawa Univ. (Ontario), Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 6G.
W79-00586

MANDATORY DEDICATION AND IMPACT FEES: A MEANS OF SHARING THE BURDEN OF GROWTH IN THE MELBOURNE-TILLMAN DRAINAGE DISTRICT,
For primary bibliographic entry see Field 6E.
W79-00601

COMBINED HOUSING AND STANDARD FOR WATER FLOW METERS,
For primary bibliographic entry see Field 7B.
W79-00827

WHAT CONSTITUTES 'BENEFITS' FOR URBAN DRAINAGE PROJECTS,
Shoemaker and Wham, Denver, CO.
For primary bibliographic entry see Field 6B.
W79-00872

VISUAL LAND USE COMPATIBILITY AS A SIGNIFICANT CONTRIBUTOR TO VISUAL RESOURCE QUALITY,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional.
For primary bibliographic entry see Field 6B.
W79-00873

COMPUTER ANALYSIS OF THE WATER BUDGET OF THE PROPOSED OAK OPENINGS NEW TOWN, LUCAS COUNTY, OHIO,
Toledo Univ., OH.
For primary bibliographic entry see Field 4C.
W79-00902

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH IN THE RALSTON CREEK WATERSHEDS,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 4C.
W79-00906

PRINCIPLES OF WATER RESOURCES PLANNING (PHASE II),
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-00913

WORKING PAPER NOS. 7 - 10 OF THE EMERGENCY WATER ALLOCATION PROJECT, (7) IMPLEMENTATION OF A PREPAREDNESS PROGRAM; (8) ACHIEVING EQUITABLE AND EFFECTIVE WATER ALLOCATION; (9) RESTORATION OF A WATER DISTRIBUTION NETWORK; (10) IMPROVING EMERGENCY PREPAREDNESS,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
For primary bibliographic entry see Field 4A.
W79-00919

WORKING PAPER NO. 11 OF THE EMERGENCY WATER ALLOCATION PROJECT, MANUAL FOR WATER SERVICE EMERGENCIES FOR THE POWAY MUNICIPAL WATER DISTRICT,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
For primary bibliographic entry see Field 4A.
W79-00920

AN OUTLINE FOR THE STUDY OF EMERGENCY WATER ALLOCATION PROCEDURES,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00921

A CONCEPTUAL MODEL OF THE WATER DELIVERY SYSTEM IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00922

THE CURRENT STATE OF EMERGENCY PLANNING FOR WATER SUPPLY IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00923

EMERGENCY WATER ALLOCATION LITERATURE: SOURCES AND RETRIEVAL,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00924

EWAP DATA ACCESS SYSTEM - A MANUAL FOR THE USE OF THE EDGE PUNCH CARD FILE,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00925

THE TRENTON WATER CRISIS OF 1975: IMPRESSIONS AND ANALYSIS,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00926

3E. Conservation In Industry

ANALYSIS OF ECONOMIC EFFECTS OF ENVIRONMENTAL REGULATIONS ON THE INTEGRATED IRON AND STEEL INDUSTRY. VOLUME I.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.

For primary bibliographic entry see Field 5G.
W79-00788

GEOTHERMAL ACTUATED METHOD OF PRODUCING FRESH WATER AND ELECTRIC POWER,
For primary bibliographic entry see Field 3A.
W79-00826

CORROSION AND SCALE INHIBITORS FOR INDUSTRIAL RECIRCULATING COOLING WATER SYSTEMS,
American Cyanamid Co., Stamford, CT. (Assignee).
T. J. Suen, and A. J. Begala, Jr.
U.S. Patent No. 4,092,244, 6 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1856, May 30, 1978.

Descriptors: *Patents, *Industrial water, *Cooling wate, Recirculated water, Scaling, Corrosion, Chemical reactions, Water reuse, Recycling.

A chemical composition and a process for inhibiting corrosion and scaling on metal surfaces in industrial cooling water systems is disclosed. The process includes the addition to he cooling water of from 10 to 200 ppm of an alkyl polyethoxy compound having a free carboxylate, sulfonate or phosphonate group. In some preferred embodiments, 10 to 500 ppm of a mineral oil is added to the water system, in addition to the polyethoxy compound. (Sinha-OEIS)
W79-00832

PROCESS FOR RECOVERING CHEMICALS FROM THE WASTE LIQOURS OF SULFATE CELLULOSE DIGESTION AND THE WASTE WATERS OF BLEACHING,
Ahlstrom (A.) Osakeyhtio, Helsinki (Finland).
For primary bibliographic entry see Field 5D.
W79-00837

METHOD OF THE REMOVAL OF METALLIC MERCURY,
Tecneco, S.p.A., Fano (Italy). (Assignee).
For primary bibliographic entry see Field 5D.
W79-00840

A METHOD OF USING IRRIGATION DRAINAGE WATER FOR POWER PLANT COOLING,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 5D.
W79-00862

3F. Conservation In Agriculture

ESTABLISHING CROP ACREAGE FLEXIBILITY RESTRAINTS FOR SUBREGIONS OF THE TEXAS HIGH PLAINS,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 6D.
W79-00505

DROUGHT INJURY AND IRRIGATION EFFECT ON THE GROWTH AND YIELD OF WARM SEASON GRASSES CULTIVATED ON MINERAL SOIL, (IN JAPANESE),
Tokai-Kinki Natl. Agric. Exp. Stn., Ishinden-Ogoso, Tsu, Mie, Jpn.
K. Okamoto, S. Horiuchi, T. Ooba, and G. Nishimura.
Bull Tokai Kinki Natl Agric Exp Stn 29, p 1-39, 1976.

Descriptors: *Drought tolerance, Crop production, *Irrigation effects, African, Bahia, Bermuda, Buffel, *Grass, *Growth rates, height, Leaf, Millet, Panic, Plant physiology, Rhodes, Sorghum, Sudan, Tillers, Wilting, *Soils(Mineral).

Most of the species in the nonirrigated plot temporarily wilted; stem elongation and leaf expansion were retarded during the drought period, late July. The species recovered rapidly from drought injury after a rainfall. Yield increase by irrigation was generally high at the time of 1st cutting after irrigation (Aug.), but became lower at the 2nd and 3rd cutting after irrigation (Sept. and Oct.). Drought resistance was evaluated with decrease in yield, plant height and leaf area in bermuda grass, bahia grass, love grass (broad leaf type), rhodes grass, panic grass, barnyard grass, sorghum, African millet, buffel grass, sudan grass and blue panic (perennial). Drought resistance evaluated with the witling degree seemed to be high in bermuda grass, blue panic and buffel grass. For most grasses water content and stem ratio of irrigated forages were higher than those of non-irrigated ones. Irrigation accelerated the elongation of regrowing stems and the development of new tillers in the initial stage of regrowth, but generally had little influence on the total number of tillers in the final stage.--Copyright 1978, Biological Abstracts, Inc.
W79-00516

INFLUENCE OF WATER AND FERTILIZER MANAGEMENT ON YIELD AND WATER-INPUT EFFICIENCY OF CORN,
Florida Univ., Quincy.
For primary bibliographic entry see Field 5B.
W79-00530

SOIL WATER MOVEMENT AND UPTAKE BY PLANTS DURING WATER INFILTRATION AND REDISTRIBUTION,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W79-00535

THE ECONOMIC REALITIES OF DROUGHT,
For primary bibliographic entry see Field 6B.
W79-00582

RECLAMATION ACT OF 1902: AFTER 75 YEARS, 160 ACRE LIMITATION HELD VALID,
For primary bibliographic entry see Field 6E.
W79-00604

DESERT TRANSFORMATION IN CHINA.
Academia Sinica, Taipei (Taiwan). Dept. of Desert Research.
For primary bibliographic entry see Field 4A.
W79-00798

THE ORGANIZATION AND EFFICIENT USE OF DESERT PASTURES IN THE USSR,
United Nations Educational, Scientific and Cultural Organization (USSR). Scientific Council on the Problems of Deserts.
V. N. Nikolaev.
Man and the Biosphere, USSR Academy of Sciences, p 1-17, Moscow, 1977.

Descriptors: *Pastures, *USSR, *Rotations, *Pasture management, Forages, Carrying capacity, Grazing, Arid lands, Land use, Deserts, Administrative organization, Land management techniques.

Although natural pastures in the desert regions of the U.S.S.R. are sparsely vegetated and excessively arid due to scarce rainfall confined to winter and autumn, they can be utilized as important sources of natural fodder for sheep and camels. Soviet scientists have worked out management plans designed to reduce the detrimental effects of natural and anthropogenic desertification in these areas. A brief history of the reclamation and use of pastures in the U.S.S.R is presented in two parts: use of pastures in the pre revolutionary period, and usage since the October socialist revolution. The former period was characterized by the nomadic herding of animals, managed only by the location of watering sites. In contrast, the second post revolution period has been dominated by planned and consistent reclamation efforts to restore the natural desert fodder. These reclamation and management techniques have been based upon more efficient interfarm organization and distribution of desert pastures and a series of rotational grazing schemes. These techniques and their successes are illustrated. (Tickes-Arizona)
W79-00802

DESERT DEVELOPMENT IN THE V. I. LENIN KARAKUM CANAL ZONE,
Desert Inst., Ashkhadad (USSR).
For primary bibliographic entry see Field 4A.
W79-00805

DESERTIFICATION AND TECHNOLOGICAL ADJUSTMENT IN THE MURRAY MALLEE OF SOUTH AUSTRALIA,
Oxford Univ. (England). School of Geography.
For primary bibliographic entry see Field 3B.
W79-00807

LAND TENURE AND DESERTIFICATION IN AUSTRALIA'S ARID LANDS,
For primary bibliographic entry see Field 6E.
W79-00811

DESERTIFICATION IN THE PASTORAL RANGELANDS OF THE GASCOYNE BASIN, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Resources Management, Canberra (Australia).
O. B. Williams.
SEARCH, Vol. 9, No. 7, p 257-261, July 1978. 4 fig, 1 ref.

Descriptors: *Range management, *Australia, Agro-meteorology, Vegetation effects, Environmental effects, Vegetation establishment, Erosion, Land reclamation, Monitoring, Grazing, Overgrazing, Pasture management, Carrying capacity, Livestock, Sheep, Biodegradation.

Annual rainfall for this area is about 200 mm. Vegetation is predominantly an extensive high shrubland, with ground layer of either annual grasses, sparse perennial grasses or small chenopodiaceous shrubs. The basin is largely pastoral, little changed since its initial settlement a century ago. Recent investigations based on several parameters of degeneration, erosion, overgrazing, a takeover by undesirable vegetation, etc., resulted in recommendations for a reduction in numbers of sheep, withdrawal of seriously damaged rangeland from grazing, and restrictions on grazing some land classified as 'a risk.' Experience indicates that research should be concentrated on the regeneration of desired species on less degraded portions of the more productive rangelands. the authors point out that monitoring sites are on grossly degraded rangeland, a usual procedure in most countries and a singularly unproductive one for pastoralist and research workers. (Tickes-Arizona)
W79-00814

HARVEST DATES IN ANCIENT MESOPOTAMIA AS POSSIBLE INDICATORS OF CLIMATIC VARIATIONS,
Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W79-00816

SPRINKLER IRRIGATION SYSTEM AND APPARATUS FOR DIRECTING A STREAM OF WATER INTO THE ATMOSPHERE,
Nelson Irrigation Corp., Walla Walla, WA. (Assignee).
B. R. Nelson.
U.S. Patent No. 4,091,996, 11 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1781, May 30, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation systems, Irrigation effficiency, Flow control, Application equipment.

A method is described of directing a source of water under pressure, which may vary within a wide range of pressures above a predetermined minimum pressure, at a substantially constant rate of flow into the atmosphere for purposes of sprinkler irrigation. The water under pressure flows through the inlet to deform a resilient annular member an amount proportional to the amount such water pressure is in excess of the predetermined minimum pressure and by such deformation to reduce the size of the opening. A constant amount of water per unit time is contained in the stream through the sprinkler irrigation system. (Sinha-OEIS)
W79-00829

ROTARY SPRINKLER ARC ADJUSTMENT,
Telsco Industries, Inc., Dallas, TX. (Assignee).
H. C. Ridgway.
U.S. Patent No. 4,091,997, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1781, May 30, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation efficiency, Irrigation practices, Application equipment, Water delivery.

An arc adjustment easily and positively maintains the arc through which a rotary sprinkler operates. The system includes a rotatable nozzle supported from a shaft with the reversing mechanism attached to the nozzle and extending from the nozzle in the direction of the shaft. A notched ring or gear is attached to the shaft below the nozzle. A first wire locking collar has one end encircling the shaft above the notched ring and the opposite end formed in a loop extending radially from the shaft and terminating in a lateral end section for engagement with the notches of the ring. The locking collars are positioned so that the loops intercept the acutating arm of the reversing mechanism as the nozzle of the rotary sprinkler rotates on the shaft. The locking collars are positioned to any selected point. (Sinha-OEIS)
W79-00830

WATER DISPENSING APPARATUS,
A. K. Kock.
U.S. Patent No. 4,092,996, 11 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 97, June 6, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Application equipment, Water delivery, Pipes.

This invention is based on the concept of using two substantially identical, extendible and collapsible pipe-systems arranged to conduct water from a water source to one or more water sprays. Each system of pipes is constructed of a number of substantially rigid pipes and pipe-coupling devices which pivotally connect the pipes at the ends to permit water to flow from pipe to pipe through the coupling devices. The system of pipes is held together by holding means and is carried above the surface of the ground by supporting means. The pipe-systems can be provided with means for moving the systems automatically along a reciprocating path of pre-determined length. The speed at which the pipe-systems reciprocate and, also, the volume of water dispensed can be pre-set. (Sinha-OEIS)
W79-00834

IRRIGATION TOWER DRIVE,
G. C. Knutson.
U.S. Patent No. 4,093,036, 6 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 971m No 1, p 110, June 6, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Application equipment, Conveyance structures, Irrigation operation and maintenance, Irrigation towers, Drive mechanisms.

Irrigation towers utilized in irrigating cultivated land are usually provided with support and drive wheels capable of slowly advancing the tower over the land to be irrigated. Inasmuch as the tower wheels are driven very slowly various operating problems are encountered. The irrigation tower drive mechanism of this invention utilizes a sufficiently numerically high ratio drive train to reduce the tendency of the tower to overdrive the drive train when the tower is proceeding down an incline and a drive mechanism which is constructed in a manner tending to reduce surges in torque applied to the support and drive wheels of the tower. In addition, the drive system is constructed in a manner where the portions subject to malfunction are completely enclosed within a housng having wet sump lubrication. (Sinha-OEIS)
W79-00835

IRRIGATION PIPE LAYING AND PICK UP VEHICLE,
M. A. Goodsell.
U.S. Patent No. 4,093,082, 8 p, 7 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 125, June 6, 1978.

Descriptors: *Patents, *Irrigation, *Irrigtion practices, *Irrigation efficiency, Irrigation operation and maintenance, Equipment, Pipes, Operations, Pipe laying equipment.

In order to make maximum use of irrigation piping it is moved from field to field as the need for irrigation changes. Therefore, it is desirable to have a vehicle specifically designed for picking up and laying irrigation pipe which reduces the manpower and equipment reqired to accomplish the task. This invention describes a self-propelled vehicle having a centrally mounted inclined guide trough for guiding pipe sections as the vehicle is driven along a row of attached pipe sections. The sections are guided upwardly to the level of a working platform. An angulation trough contacts the end of a pipe section an angulates a first pipe section relative to the next section so that the first section can be disconnected. Disconnected sections are placed in racks on either side of the platform. The two ends of the guide trough have different inclinations to aid in the assembly of the pipe sections when laying pipe. (Sinha-OEIS)
W79-00836

IRRIGATION APPARATUS,
O. DeRomano.
U.S. Patent No. 4,094,466, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 590, June 13, 1978.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, Irrigation systems, Irrigation efficiency, Application equipment, Diffusion.

A device for underground drainage and irrigation of soil includes a porous element which can be engaged about a distribution pipe at a perforation or opening in the pipe. Apertures in a pipe distribution system can be provided in two ways. In the first instance, a space may be provided between the ends of two separate, aligned pieces of pipe. The porous filter or diffusion member can be in the form of a flange connector joining the two adjacent pipe sections. Or the flow passages or apertures are formed by perforating a pipe at selected locations. The location and size of the perforations are selected according to the desired characteristics of the system. The apertures are selected according to the desired characteristics of the system. The apertures are then covered by a porous element permitting flow to be dispersed across the aperture and through the element. The individual porous elements are comprised of a quantity of small plastic particles, as for example, pellets of polyvinylchloride, sintered by application of heat, pressure or a bonding agent. The sintering leaves interstitial spaces to allow passage of fluid through the element. (Sinha-OEIS)
W79-00844

SPRINKLER HEAD SELECTIVELY OPERABLE IN A PART-CIRCLE MODE OR A FULL CIRCLE MODE,
Nelson Irrigation Corp., Walla Walla, WA. (Assignee).
L. P. Meyer.
U.S. Patent No. 4,094,467, 10 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 590, June 13, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation efficiency, Application equipment, Water delivery.

A sprinkler head having a reversing mechanism cooperable with spaced cam assemblies for effecting part circle mode operation in which the cam element of one of the cam assemblies is selectively movable by a spring pressed over center toggle linkage between two position, one of which causes the sprinkler head to operate in a part circle mode and other of which causes the sprinkler head to operate in a full circle mode. (Sinha-OEIS)
W79-00845

DECISION THEORY APPLICATIONS AND IRRIGATION OPTIMIZATION,
California Univ., Davis. Dept. of Civil Engineering.
M. J. English, and G. T. Orlob.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 436, Price codes: A04 in paper copy, A01 in microfiche. Contribution No. 174, Water Resource Center, Technical Completion Report September 1978, 48 p, 24 fig, 9 tab, 66 ref. (California Water Resources Center Project UCAL-WRC-W-538).

Descriptors: Irrigation, Economics, *Computer models, *Economic efficiency, *Irrigation efficiency, *Optimization, *Irrigation water use, *Water utilization, *Risks, Water supply, Decision making, Crop production.

This research concerns economic optimization of irrigation water use. Statistical decision theory is employed in the analysis, and particular attention is given to questions of uncertainty and utility. A general analytical model for dealing with the complex uncertainties in the relationship between irrigation water use and net farm income is developed. Non-linear utility functions are approximated by quadratic polynomials, leading to a simplified analysis of the decision problem in terms of mean and variance of net farm income. The analysis is extended to include portfolio combinations of two crops. The theoretical framework is applied to a case study involving farmers operating with a limited water supply. Optimal cropping patterns are selected for each of seven farmers. The cropping patterns considered include various combinations of two different crops and fallow land. Case study results indicate that a decision theoretic approach to irrigation optimization will lead to optimal irrigation strategies that may differ substantially from strategies selected without regard for uncertainty and utility. These optimal strategies will be more consistent with the preferences of the individual farmers. (Snyder-Calif, Davis)
W79-00857

ECONOMIC BENEFITS TO AGRICULTURE IN THE SAN JOAQUIN VALLEY DUE TO LONG-TERM PREDICTION STREAMFLOW FORECASTING,
California Univ., Los Angeles. Dept. of Engineering Systems.
M. J. Cohn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 377, Price codes: A04 in paper copy, A01 in microfiche. Master of Science in Engineering Thesis, 1978. 50 p, 11 fig, 4 tab, 16 ref, 3 append. (California Water Resources Center Project UCAL-WRC-W-535).

Descriptors: Surface runoff, *Groundwater, *Costs, *Mathematical models, Groundwater recharge, California, Agriculture, Benefits, *Streamflow forecasting, *Economics, *San Joaquin Valley(Calif).

A mathematical model of a surface water and ground water system is developed to study agricultural benefits for various uncertainties of long-range streamflow forecasting. Both optimization and simulation techniques were used to solve the problem considering cost of water as a parameter. The model is specifically formulated to study San Joaquin Valley State Water Project Service Area agricultural benefits. Fifty years of historical data are routed through the State Water Project and Central Valley Project year 2000 level operation to obtain surface water deliveries. Three studies were evaluated: (1) sensitivity of benefits to increased or decreased historical flows, (2) effect of long-term (one year) streamflow prediction uncertainties on benefits and (3) effect of constant estimated streamflow on benefits. It is concluded that maximum benefits occur when maximum cotton acreage is planted every year. (Snyder-Calif, Davis)
W79-00861

NITROGEN FERTILIZER MANAGEMENT OF A LEMON ORCHARD AS RELATED TO NITRATE-POLLUTION POTENTIAL OF GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agriculture Engineering.
For primary bibliographic entry see Field 5B.
W79-00899

ECONOMIC IMPACT OF FOSSIL ENERGY ALTERNATIVES ON CALIFORNIA IRRIGATED AGRICULTURE,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-00908

ECONOMIC IMPACT OF FLOODING ON AGRICULTURAL PRODUCTION IN NORTHEAST CENTRAL NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-00911

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

OPTIMIZATION OF REAL-TIME HOURLY OPERATIONS OF A COMPLEX, MULTIPLE PURPOSE RESERVOIR SYSTEM,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 6A.
W79-00501

A PROPOSED REVISION OF KENTUCKY'S WATER RIGHTS LEGISLATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6E.
W79-00524

AQUATIC FORAGE PROCESSING IN FLORIDA,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. O. Bagnall, T. W. Casselman, J. W. Kesterson, J. F. Easley, and R. E. Hellwig.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 20, No. 2, p 221-225, 1977. 4 fig, 4 tab, 21 ref. OWRT A-017-FLA(9), 14-31-0001-3809.

Descriptors: Drying, Chemical analysis, Nutrients, Digestion, *Aquatic weeds, *Water hyacinth, *Rooted aquatic plants, Animal physiology, Toxins, Feeds, *Florida, *Hydrilla.

The aquatic weeds, water hyacinth (Eichhornia crassipes) and hydrilla (Hydrilla verticillata), were chopped, mechanically dewatered, dehydrated and pelleted to determine whether they could be processed effectively and efficiently in existing processing systems and components. Pressing removed 60 to 80 percent of the water and 18 to 38 percent of the dry matter. The pressed products were difficult to dry rapidly and pellet. (Morgan-Florida)
W79-00531

BIOLOGICAL CONTROL OF AQUATIC WEEDS WITH PLANT PATHOGENS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
T. E. Freeman.
Aquatic Botany, Vol. 3, p 175-184, 1977. 1 tab, 47 ref. OWRT A-033-FLA(3), 14-34-0001-7020.

Descriptors: *Biocontrol, Water weeds, *Plant pathogens, *Aquatic weed control.

Plant pathogens have characteristics that make them desirable candidates as biological control agents for aquatic weeds. They are: (1) numerous and diverse; (2) often host specific; (3) easily disseminated and self-maintaining; (4) capable of limiting populations without eliminating the species; and (5) non-pathogenic to animals. Recent investigations have revealed several pathogens with biocontrol potential. The algal viruses and the water hyacinth (Eichhornia crassipes (Mart.) (Solms-Laub.) pathogens, Acremonium zonatum (Sawada) Gams, Bipolaris stenospila (Drechs.) Shoemaker, Cercospora rodmanii Conway, Rhizoctonia spp and Uredo eichhorniae Fragoso and Ciferri have been studied the most extensively and appear to hold promise as biocontrol agents. (Morgan-Florida)
W79-00534

PRELIMINARY GUIDE TO WETLANDS OF PENINSULAR FLORIDA; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-00547

ZOOPLANKTON STANDING CROPS IN THE DISCHARGE OF LAKE FRANCIS CASE, 1966-1972,
Fish and Wildlife Service, Yankton, SD.
For primary bibliographic entry see Field 5C.
W79-00551

TILAPIA--A MANAGEMENT TOOL FOR BIOLOGICAL CONTROL OF AQUATIC WEEDS AND INSECTS,
California Univ., Riverside. Div. of Biological Control.
For primary bibliographic entry see Field 5G.
W79-00592

MANDATORY DEDICATION AND IMPACT FEES: A MEANS OF SHARING THE BURDEN OF GROWTH IN THE MELBOURNE-TILLMAN DRAINAGE DISTRICT,
For primary bibliographic entry see Field 6E.
W79-00601

THE ICEBERG COMETH.: INTERNATIONAL LAW RELATING TO ANTARCTIC ICEBERG EXPLOITATION,
For primary bibliographic entry see Field 6E.
W79-00603

A EXPERIENCE IN DECIPHERING SPACE PHOTOGRAPHS AND TELEVISION IMAGES OF THE USTYURT PLATEAU FOR HYDROLOGICAL PURPOSES (IN RUSSIAN),
For primary bibliographic entry see Field 7B.
W79-00609

STATISTICAL SUMMARY OF STREAMFLOW DATA FOR KANSAS STREAMS IN THE ARKANSAS RIVER BASIN,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00626

FLOODS IN KANSAS CITY, MISSOURI AND KANSAS, SEPTEMBER 12-13, 1977,
Geological Survey, Rolla, MO. Water Resources Div.; and Geological Survey, Topeka, KS. Water Resources Div.
L. D. Hauth, and W. J. Carswell, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A057 486, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-63, May 1978. 36 p, 16 fig, 2 tab, 4 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Peak discharge, *Flood profiles, Gaging stations, Streamflow, Rainfall-runoff relationships, Flood frequency, Hydrologic data, Hydrographs, Missouri, Kansas, *Kansas City area.

The storm of September 12-13, 1977, produced as much as 16 inches of rainfall in the Kansas City, Missouri-Kansas area, left 25 persons dead, many homeless, and over 50 million dollars in damages. Flood hydrographs taken from U.S. Geological Survey gaging-stations reflected two storms occurring within 24 hours. Measured precipitation indicated each storm event to be near a 100-year, 24-hour rainfall frequency. Peak discharges determined at selected locations in areas of greater rainfall depths exceeded those of the 100-year floods. (Woodard-USGS)
W79-00638

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977--VOLUME 2. TRUST TERRITORY OF THE PACIFIC ISLANDS, GUAM, AMERICAN SAMOSA, AND NORTHERN MARIANA ISLANDS.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00640

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977-hVOLUME 1. HAWAII.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00641

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1977.
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00642

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1977.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00643

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1977.
Geological Survey, Lincoln, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00644

SEVERAL PROBLEMS OF THE RATIONAL CONSTRUCTION AND EXPLOITATION OF RESERVOIRS AND CANALS AS EXAMPLIFIED BY THE UCHINSKOYE RESERVOIR AND THE MOSCOW CANAL, (IN RUSSIAN),
All-Union Hydrobiological Society, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W79-00655

HYDROLOGY, FULTON COUNTY, NEW YORK,
Fulton County Planning Dept. Johnstown, NY.
H. W. Fear.
August 1972, Series No. 0872-FCPD-FC-HY, 37 p, 20 fig, 10 tab. NYP-246.

Descriptors: *Hydrologic cycle, *Precipitation cycle, *Mean daily discharge, *Water supply, *Water resources, *Hydrology, Aquifer, Water table, Groundwater, Streamflow, Topography, Snowmelt, Droughts, Runoff, *Fulton County(NY), Isopleth, Wind.

The purpose of this report is to cover that portion of Fulton County's water resources related to precipitation and its resultant runoff. Records of precipitations at 14 sites and of temperatures at 5 sites in Fulton County and adjacent areas have been selected for this comprehensive hydrologic study. The 8-year period of record is 1965-1972, selected as being representative of general hydrologic conditions in Fulton County. Amounts of precipitation recorded at each of the 14 selected sites have been tabulated for each of the 8 years and are presented in tables. To illustrate the runoff from snowmelt and spring rains, hydrographs of mean daily discharges at selected points for the months of least average precipitation and months of highest average precipitation are included. Other information included in the report is the lowest and highest temperatures during each year, wind movement in Fulton County and a discussion of evaporation. A companion volume on snow resources has also been prepared. (Coan-NC)
W79-00663

STREAMS AND DRAINAGE BASINS, FULTON COUNTY, NEW YORK,
Fulton County Planning Dept. Johnstown, NY.
H. W. Fear.
December 1970, Series No. 1270-FCPD-FC-DB, 40 p. NYP-223.

Descriptors: *Drainage area, *Flood area, *Runoff, *Stream flow, *River basins, *Water resources, Floods, Recreation, Reservoirs, Streams, *Fulton County(NY), *Mohawk River(NY), *Sacandaga River(NY), Hudson River(NY), Hydraulic data, Water impoundment.

Surface waters of Fulton County find their way to two major tributaries of the Hudson River: streams in the northeastern part, draining nearly 34% of the county, are in the Sacandaga River Basin; those in the western section, draining 66% of the county, flow into the Mohawk River Basin. The purpose of this report is to present data on the delination and size of streams in Fulton County which are contributors to the flow of the Sacadaga River and Great Sacandaga Lake and to the flow of the Mohawk River. Information is presented on the physical characteristics of Fulton County. Delineation of watersheds of Fulton County streams in the Mohawk River Basin was made using 18 U.S. Geological Survey (USGS) topographic maps. Streamflow records of runoff are presented in tables. Delineation of the watersheds of the Sacandaga River was made using 11 USGS topographic maps. Flood problems are discussed; possible flood areas are noted on maps and data are provided on probable high-water elevations. Water impoundments areas are noted for potential municipal water supplies and flood control; dam heights at certain points are calculated and their resultant reservoir sizes are estimated.
W79-00664

FLOOD PLAIN INFORMATION: OGDEN RIVER, OGDEN, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for Weber Area Council of Governments, UT, June 1971, 22 p, 6 fig, 7 plates, 5 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Historic floods, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Zoning, Control structures, Reservoirs, Flood plains, Flood flow, Ogden(UT), *Ogden River(UT), Weber County(UT), Intermediate Regional Flood.

The study area involves the Ogden River and its flood plain in Weber County, Utah, including the City of Ogden. Land uses occupying the flood plain include agriculture, commercial, manufacturing, and residential development, recreation facilities, and transportation and communication installations. Flood data were obtained from topographic maps, field studies, historical sources, and discontinuous stream gage records. Flooding results from high intensity convective-type cloudburst storms. Such storms occur from mid-April through September, but occur most frequently in July and August. Measures utilized to reduce flood damage potential in the study area include two reservoirs, channel maintenance, watershed management, and fire protection in the uncontrolled tributary area. The worst recorded flood occurred in April, 1936, discharging 3,700 cubic feet per second (cfs). At the upstream study limit, the Intermediate Regional Flood would discharge 2,200 cfs, while the Standard Project Flood would discharge 3,400 cfs. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00669

FLOOD PLAIN INFORMATION: BOX ELDER CREEK, BRIGHAM CITY, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for Utah Division of Water Resources, Box Elder County, and Brigham City, UT, June 1975, 41 p, 12 fig, 9 plates, 6 tab.

Descriptors: *Utah, *Flooding, *Flood profiles, *Flood data, *Peak discharge, *Flood protection, Floods, Historic floods, Flood peak, Flow characteristics, Flood plains, Standard Project Flood, Non-structural alternatives, Building codes, Land use, Planning, Zoning, Control structures, Levee, Floodwalls, Dams, Channel improvement, Brigham City(UT), *Box Elder Creek(UT), Intermediate Regional Flood.

The study area includes Box Elder Creek and its flood plain in the vicinity of Brigham City, Utah. Sixty percent of the flood plain is devoted to non-intensive land uses, and the remainder is developed with residential, commercial, industrial, and transportation uses. Flood data were obtained from topographic maps, field studies, historical sources, and discontinuous stream gage records. Cloudburst storms may cause flooding at any time, but they most commonly occur in July and August. Snowmelt flooding does not constitute a serious hazard. The flood of February 1911 is believed to be the area's worst flood event. No streamflow records are available. The maximum recorded peak flow of 290 cubic feet per second (cfs) occurred on April 18, 1962. At the downstream study limit, the Intermediate Regional Flood would discharge 1,100 cfs while the Standard Project Flood would discharge 2,900 cfs. Both floods would crest at approximately 4,220 feet mean sea level. There are no existing or authorized flood control structures that would reduce flood damage in the study area. Structural and non-structural flood control measures are described. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00670

FLOOD PLAIN INFORMATION: WOLF CREEK, LAWTON, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Lawton, OK, June 1972, 34 p, 9 fig, 33 plates, 5 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Historic floods, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Lawton(OK), *Wolf Creek(OK), Intermediate Regional Flood.

The study area involves Wolf Creek and its flood plain in the vicinity of Lawton, in Comanche County, Oklahoma. Land use in the flood plain is residential and commercial. Flood data were obtained from topographic maps, historical sources, and field studies. No stream gage records exist. Intense storms of short duration produce most floods during the spring and fall. Eight major floods have occurred since 1936 with the worst flood occurring in May 1957. On the main branch of Wolf Creek, the Intermediate Regional Flood (IRF) would discharge 20,500 cubic feet per second (cfs), and would rise 5.6 feet, while the Standard Project Flood (SPF) would discharge 32,600 cfs and would rise 7.1 feet. No structural flood control measures capable of affecting major floods are anticipated. Non-structural measures have been instituted by the city and the county. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00671

FLOOD PLAIN INFORMATION: CHIKASKIA RIVER, BLACKWELL, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Blackwell, OK, June 1976, 26 p, 7 fig, 11 plates, 5 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Historic floods, Flow characteristics, Flood plains, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, *Chikaskia

River(OK), Blackwell(OK), 100-year flood, 500-year flood.

The study area includes 8.4 channel miles of the Chikaskia River and its flood plain in the vicinity of Blackwell, Oklahoma. Developments in the flood plain consist of residential land uses on the river's east side and agricultural land uses on the west. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Storms may cause flooding at any time of year, but they occur most frequently in the spring and summer months. The region's larger floods result from intense local thunderstorms. The worst recorded flood occurred in June 1923, discharging 100,000 cubic feet per second (cfs) and cresting 12 feet above flood stage. Other significant floods occurred in 1942 and 1973, discharging 85,000 cfs and 63,500 cfs, respectively. The 100-year flood would discharge 159,000 cfs and would crest 20.3 feet above flood stage, while the 500-year flood would discharge 268,000 cfs and would crest 24.1 feet above flood stage. Four of the area's five bridges would be obstructive to the 100-year flood. Although no structural flood control measures exist, the city of Blackwell has instituted non-structural measures. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00672

FLOOD PLAIN INFORMATION: PROVO RIVER AND ROCK CANYON CREEK, PROVO-OREM, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for Board of County Commissioners, Utah County, UT June 1971, 34 p, 8 fig, 8 plates, 7 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Streamflow forecasting, Historic floods, Flood stages, Flood plains, Standard project flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Levees, Reservoirs, *Provo River(UT), *Rock Canyon Creek(UT), *Provo(UT), *Orem(UT), Utahing County(UT), Intermediate Regional Flood.

The study area involves the flood plains of the Provo River and Rock Canyon Creek in the vicinity of Provo and Orem, Utah County, Utah. The flood plain is devoted primarily to agricultural and recreation uses, but some residential and commercial development is beginning to take place at the lower end of the study reach. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding may result from snowmelt or high intensity, convective-type thunderstorms. Snowmelt flooding occurs from late April through early July, while rainfall flooding occurs from May through September. Existing flood control measures include a small reservoir, some low, discontinuous levees, watershed treatment measures, and fire protection in the Basin. Another reservoir is authorized, and non-structural measures are being considered. The worst recorded flood recorded at the Prove gage occurred on May 6, 1972, discharging 2,520 cubic feet per second (cfs). At the downstream study limit during the Intermediate Regional Flood (IRF), The Provo River and Rock Canyon Creek would discharge 3,000 and 2, 100 cfs, srespectively, and would crest at 4,607 and 4,631 feet mean sea level (msl), while the Standard Project Flood (SPF) would discharge 5,200 and 3,200 cfs respectively, and would crest at 4607.5 and 4632 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00673

FLOOD PLAIN INFORMATION: COODY CREEK, MUSKOGEE, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Muskogee, OK, February 1973, 27 p, 7 fig, 15 plates, 5 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, *Floods, Flood flow, Historic floods, Flood stages, Flow characteristics, Flood plains, Standard project flood, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, Muskogee(OK), *Coody Creek(OK), Intermediate Regional Flood.

The study area includes Coody Creek and its flood plain in the vicinity of Muskogee, Oklahoma. Development of the flood plain is not extensive, although increased development pressure is anticipated. Flood data were obtained from topographic maps, field studies and historical sources. No stream gage records were available. Most floods are caused by intense thunderstorms occurring from May through October. Severe floods occurred in 1957 and 1961. In the lower study reach, the Intermediate Regional Flood (IRF) would discharge 24,400 cubic feet per second (cfs) and would rise 40.7 feet, while the Standard Project Flood (SPF) would discharge 47,100 cfs and would rise 42.7 feet mean sea level (msl). No structural flood control measures are anticipated, and non-structural measures have not been enacted. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00674

FLOOD PLAIN INFORMATION: HAIKEY CREEK, TULSA COUNTY, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for Tulsa Metropolitan Area Planning Commission, OK, September 1973, 27 p, 5 fig, 21 plates, 5 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flood flow, Historic floods, Flow characteristics, Flood plains, Standards Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, *Haikey Creek(OK), Tulsa County(OK), Intermediate Regional Flood.

The study area includes Haikey Creek, its tributaries, and their flood plains in Tulsa County, Oklahoma. Intensive land use in the study area is limited, although development pressure from the cities of Tulsa and Bixby is anticipated. Flood data were obtained from topographic maps, historical sources, and field studies. No stream gage records are available. The worst known flood occurred in 1943. Other large floods occurred in 1970 and 1971. Intense rainfall most frequently causes flooding from May through October. On Haikey Creek, the Intermediate Regional Flood (IRF) would discharge 18,240 cubic feet per second (cfs) and would rise 3.6 feet, while the Standard Project Flood (SPF) would discharge 30,300 cfs and would rise 5.4 feet. Historical and future flood data are also presented for the major tributaries to Haikey Creek. Twenty-seven bridges in the study area would obstruct the IRF. There are no major flood control measures contemplated for the area. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00675

FLOOD PLAIN INFORMATION: PRYOR CREEK AND SALT BRANCH, PRYOR CREEK, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Pryor Creek, OK, May 1974, 36 p, 7 fig, 14 plates, 5 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Historic floods, Flood stages, Flood plains, Flood protection, Standard Project Flood, Non-structural alternatives, Land use, Planning, Control structures, *Pryor Creek(OK), Salt Branch(OK), Mayes County(OK), Intermediate Regional Flood.

The study area includes Pryor Creek, Salt Branch, and their flood plains in the vicinity of Pryor Creek, Oklahoma. Land use in the flood plain is almost exclusively agricultural. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. Most flood-producing storms occur from April through September. The worst flood recorded on Pryor Creek occurred on October 3, 1959, discharging an estimated 32,000 cubic feet per second (cfs) and cresting at 601.18 feet mean sea level (msl). In the lower reach of the study area, the Intermediate Regional Flood would discharge 70,000 cfs and would crest 15.9 feet above flood stage, while the Standard Project Flood would discharge 106,000 cfs and would crest 20.3 feet above flood stage. Historical and projected flood data are also presented for Salt Branch. A flood damage prevention measure has been proposed for the Pryor Creek watershed. No plans have been developed for Salt Branch. The City of Pryor does not regulate use of the flood plain. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00676

FLOOD PLAIN INFORMATION: STILLWATER CREEK AND TRIBUTARIES, STILLWATER, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Stillwater,OK, June 1968, 66 p, 15 fig, 30 plates, 17 tab.

Descriptors: *Oklahoma, *Flooding, *Flood profiles, *Flood data, *Flood peak, Floods, Historic floods, Flow duration, Flow characteristics, Stage-discharge relations, Rivers, Flood plains, Flood protection, Standard project flood, Non-structural alternatives, Land use, Planning, Control structures, Reservoirs, *Stillwater Creek(OK), Stillwater(OK), Cow Creek(OK), Duck Creek(OK), East and West Boomer Creeks(OK), East and West Brush Creeks(OK), Intermediate Regional Flood.

The study area includes Stillwater Creek, its tributaries, and their flood plains in the vicinity of Stillwater, Oklahoma. Within the city, the flood plain is extensively developed. Elsewhere, the flood plain is mostly agricultural. Flood data were obtained from topographic maps, field studies, and historical sources. Stream gage records exist for only three years. The worst recorded flood on Stillwater Creek occurred in October 1959, cresting at 856.7 feet mean sea level (msl) and discharging an estimated 51,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would discharge 40,100 cfs and would crest at 856.0 feet msls, while the Standard project Flood (SPF) would discharge 77,600 cfs and would crest at 860.2 feet msl. All six of the bridges crossing the creek would be obstructive to the IRF. Descriptions of the Creek's major tributaries are presented--Cow Creek, Duck Creek, East and West Boomer Creeks, East and West Brush Creeks, as well as flood data for these tributaries. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-00677

ANCESTRAL NIAGARA RIVER DRAINAGE: STRATIGRAPHIC AND PALEONTOLOGIC SETTING,
State University of New York at Buffalo. Dept. of Geological Sciences.
P. E. Calkin, and C. E. Brett.
Geological Society of American Bulletin, Vol. 89, No. 8, p 1140-1154, August 1978. 6 fig, 3 tab, 51 ref.

Descriptors: *History, *Stratigraphy, *Rivers, Lakes, Geology, Basins, Watersheds(Basins), Mollusks, Ice, Carbon radioisotopes, *Paleontology, *Niagara River, Glacial oscillation, Glaciolascustrine deposits.

The modern Niagara River was initiated as a multi-outlet river-lake system following the last ice retreat from the area about 12,300 yr B.P. This system extended from Early Lake Erie to the contemporaneously formed Galcial Lake Iroquois in the Ontario basin. The last major ice advance and one subsequent glacial oscillation associated with the ice retreat are recorded in sequences of glaciolacustrine deposits and till along the present Gorge wall and within older bedrock spillways. Dated wood overlying Iroquois silts and till within the Lockport spillway, east of Niagara, suggest that the multi-outlet (Lake Tonawanda) phase of the drainage ceased about 10,900 yr B.P. with concentration of the outflow, and hence major gorge recession, at Lewiston. Radiocarbon analysis of mollusks from river gravels at the top of the Niagara Gorge at Whirlpool Park indicated that cataract recession from Lewiston to this site of intersection with the much older buried St. Davids Gorge occurred after 9800 yr B.P. Lake Tonawanda persisted near the present site of Niagara Falls until about 1,000 yr ago; however, dated mollusks imply that deposition here was interrupted by intense scouring shortly before 3800 yr B.P., which may have been response to the closing of the North Bay outlet of the upper Great Lakes and consequent large increase in discharge through Lake Erie. Mollusks which occur in the ancient Niagara River gravels are well preserved and distinctly zoned. The Lake Tonawanda fauna, heretofore undescribed, includes about 15 species, all of which are extant in the region. (Lee-ISWS)
W79-00703

CHANNEL ROUTING BY FINITE DIFFERENCE METHOD,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-00704

GREAT LAKES WATER LEVELS 1974. DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
National Ocean Survey, Detroit, MI. Lake Survey Center.
For primary bibliographic entry see Field 7C.
W79-00706

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES.
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 7B.
W79-00711

KOLYMA WATER BALANCE STATION, MAGADAN OBLAST, NORTHEAST U.S.S.R.: UNITED STATES-SOVIET SCIENTIFIC EXCHANGE VISIT,
Forest Service (USDA), College, AK. Inst. of Northern Forestry.
For primary bibliographic entry see Field 4D.
W79-00716

EFFECT OF DEPTH ON DREDGING FREQUENCY; REPORT 1, SURVEY OF DISTRICT OFFICES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. J. Trawle, and J. A. Boyd, Jr.
Technical Report H-78-5, May 1978 (Report 1 of a series). 39 p, 4 tab.

Descriptors: *Channel improvement, *Dredging, *Harbors.

Evaluates the effectiveness of advance maintenance dredging (overdepth dredging) in reducing dredging frequency and/or costs in the maintenance of coastal and inland channels and harbors, and establishes necessary guidelines for governing the practice. Defines the state of the art and presents the results of a survey of U.S. Army Engineer Corps district offices to determine the extent of the usage of advance maintenance dredging. Thirty-five Corps district offices and two division offices (no districts within the division) participated in the survey. The districts are classified as either coastal or inland. Coastal districts include a part of the coastline of the Atlantic or Pacific Ocean or the Gulf of Mexico. Inland districts do not include any of these coastalines within their boundaries. Results of the survey indicate that advance maintenance dredging is practiced on many projects in the coastal districts, particularly those along the southeast Atlantic and Gulf coasts, while it is sparingly practiced (beyond the current dredging season) in the inland districts. Advance maintenance dredging applicability is determined in most cases by previous experience with the practice and, to a lesser degree, by historical shoaling rates. (WES)
W79-00767

NUISANCE AQUATIC MACROPHYTE GROWTH,
Army Engineer District, Walla Walla, WA.
E. Hesser, and E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 16, p 11-13, June 1978. 1 fig, 2 tab., 7 ref. DACW 68-72-C-0269.

Descriptors: *Pacific Northwest U.S., *Aquatic weeds, *Macrophytes, *Columbia River, *Snake River, *Habitats, Land use, Washington, Oregon, Idaho, Montana, Watersheds(Basins), Altitude, Water temperature, Coasts, Surveys, Agricultural runoff, Pastures, Urban runoff, Elodea, Potamogeton, Chara, Ranuculus, Ceratophyllum, Myriophyllum, Nitella, Nuphar.

A survey of aquatic nuisance macrophytes at 723 sites in the Columbia and Snake River watersheds in Washington, Oregon, and Idaho (April-September 1973) showed 70% of specific problems were caused by eight genera: Elodea, Potamogeton, Chara, Ranuculus, Ceratophyllum, Myriophyllum, Nitella, and Nuphar. Sites, classified according to adjacent land use, water body type, altitude, water temperature, and nuisance growth, were subjected to matrix analysis. Nuisance weed growths were heaviest near population centers, near intensively grazed pastures, or in water bodies receiving irrigated agricultural runoff. Sites were selected on the basis of diversity of habitat and plant species, and of high standing crops of nuisance aquatic vegetation. Most taxa showed little apparent geographical or river basin zonation, and all problem taxa were very widespread. The presence or absence of a taxon in a specific river drainage depended on suitability of the habitat rather than being a function of prior introduction. Certain habitats were strongly related to heavy macrophyte growth: 60% of small ponds and 53.7% of small lakes had heavy growths, while only 30% of large lakes, 28.7% of rivers, and 11.4% of drawdown reservoirs had heavy growths. Drawdown pools and rivers generally were poor plant habitats. Aquatic weed problems were most common at lower altitudes and higher temperatures. Elodea, Nitella, and Nuphar had little or no correlation with land use or type of water body. (Lynch-Wisconsin)
W79-00769

ENVIRONMENTAL EFFECTS OF MECHANICAL HARVESTING,
Ontario Ministry of the Environment, Rexdale. Water Resources Branch.
I. Wile.
Journal of Aquatic Plant Management, Vol. 16, p 14-20, June 1978. 3 fig, 6 tab, 14 ref.

Descriptors: *Mechanical control, *Harvesting, *Chemung Lake(Ontario Canada), *Aquatic weed control, *Eurasian water milfoil, *Eutrophication, *Nutrient removal, Phosphorus, Myriophyllum spicatum, Myriophyllum exalbescens, Vallisneria americana, Macrophytes, Submerged plants, Phytoplankton, Algae, Nutrients, Lakes, Ontario(Canada), Canada, Runoff, Shallow water, Limiting factors, Fisheries, Recreation, Environmental effects.

Experimental harvesting of nuisance aquatic plants, particularly Eurasian water milfoil (Myriophyllum spicatum), was conducted 1973-75 in southern Chemung Lake, near Peterborough, Ontario, Canada, as an alternative to chemical treatment. In 1973, 1290 metric tons were removed from 266 ha, 2160 metric tons from 262 ha in 1974, and 3380 metric tons from 297 ha in 1975. M. spicatum, M. exalbescens, and Vallisneria americana dominated among submerged macrophytes, which covered some 430 ha (50%) of the surface of southern Chemung Lake. Although a marked growth of M. spicatum with concurrent reductions in M. exalbescens and Vallisneria throughout the lake system complicated evaluation of harvesting effects on plants, growth rates appeared lower in harvested areas. Peak annual biomass values were similar during the study period, ranging from 300-400 g dry wt/sq m. In 1975 harvested plants contained 560 kg phosphorus, equivalent to 47% of gross and 92% of net annual phosphorus loading to southern Chemung Lake. Significant reductions in phytoplankton biomass resulted from harvesting, from 2400-4700 in 1972 to 1750-2100 in 1976. Fish populations were unaffected by the harvesting. In experimental plots, multiple harvests effectively reduced stem densities of M. spicatum. Notably different results of harvesting at Lake Sallie, Minnesota are due to several environmental differences. (Lynch-Wisconsin)
W79-00770

MACROPHYTE CONTROL BY HARVESTING AND HERBICIDES: IMPLICATIONS FOR PHOSPHORUS CYCLING IN LAKE WINGRA, WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W79-00771

AQUATIC WEED MANAGEMENT BY BENTHIC SEMI-BARRIERS,
State Univ. of New York Coll. at Fredonia. Environmental Resources Center.
R. J. Mayer.
Journal of Aquatic Plant Management, Vol. 16, p 31-33, June 1978. 1 tab, 14 ref.

Descriptors: *Aquatic weed control, *Methodology, *Screens, *Barriers, *Rooted aquatic plants, *Mechanical control, Myriophyllum exalbescens, Potamogeton crispus, Chautauqua Lake(NY), New York, Equipment, Semi-barriers, Fiberglass, Eutrophication, Lakes, Shallow water, Littoral, Benthos, Water management.

A control method for rooted aquatic weeds using a bottom covering of closely woven (62 apertures/sq cm) polyvinyl chloride-coated fiberglass screening resulted in 95% plant eradication in 2-3 weeks, and 95% long-term weed-free maintenance. No adverse ecological effects were detected, and fish,

attached algae, and benthic fauna (especially fish food organisms) were observed over or on the screens. Unlike impermeable polyethylene sheeting, the fiberglass mesh semi-barrier permits exchange of dissolved nutrients and gases between benthic communities and the overlying water column. The tests were conducted 1973-77 in Chautauqua Lake, New York, a shallow eutrophic lake producing intensive littoral weed communities each summer and fall dominated by American water milfoil (Myriophyllum exalbescens) in the northern basin and curly leaf pondweed (Potamogeton crispus) in the southern basin. Mesh sizes of 9.9, 39, and 62 apertures/sq cm were used. The 39-aperture mesh absorbs 49% of incident radiation, while 62-aperture screening absorbs 60%. Screens were affixed with bricks or T-bars. The 62-aperture mesh was most effective (85-95%), followed by 39-aperture (40-60%) and 9.9-aperture (20%). Regrowth with 62-aperture mesh was limited to dwarf plants, while the 39-aperture mesh was less effective in controlling long-term growth. Sedimentation on top of screens resulted in some regrowth; this could be eliminated by removing and repositioning the screens annually. (Lynch-Wisconsin)
W79-00774

COMPARATIVE EFFECTS OF GRASS CARP AND SELECTED HERBICIDES ON MACROPHYTE AND PHYTOPLANKTON COMMUNITIES,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 5C.
W79-00778

AN APPROACH TO ESTIMATING THE STANDING CROP OF WATERHYACINTH,
Commonwealth Scientific and Industrial Research Organization, Brisbane (Australia). Long Pocket Labs.
For primary bibliographic entry see Field 5G.
W79-00779

EFFECT OF PH ON THE NATURE OF COMPETITION BETWEEN EICHHORNIA CRASSIPES AND PISTIA STRATIOTES,
Khartoum Univ. (Sudan).
For primary bibliographic entry see Field 5C.
W79-00780

THE EFFECT OF DAYLENGTH AND TEMPERATURE ON HYDRILLA GROWTH AND TUBER PRODUCTION,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5C.
W79-00781

TRADITIONAL LAND USE IN MARGINAL DRYLANDS,
United Nations Environment Programme, Nairobi (Kenya); and Secretariat for International Ecology (Sweden).
A. Hjort.
Ecological Bulletin (Stockholm), Vol. 24, p 43-53, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Land use, *Nomads, *Marginal productivity, Agriculture, Dry farming, Migration, Land tenure, Land management, Rural sociology, Motivation, Pastoralism, Psychological aspects, Decision making, Kenya, Sudan.

Land use patterns of nomadic, semi nomadic and transhumat populations inhabiting marginal areas are analyzed here. Although this categorization is not always useful, it is helpful to analyze land use strategies of those living in marginal lands as they have been found to adopt practices that are defined by local limitations. A distinction between pastoralists and agricultural groups must be made as the focus of the social, economic and political organization of the two is basically different. Two land use strategies based upon local conditions are outlied to demostrate two typical kinds of economics. The Samburu nomads northwest ofMt. Kenya are analyzed to illustrate pastoralism and diversification, and the Nuer people of the southern Sudan are described to demonstrate hoe cultivation, transhumace and pastoralism. The recurrent point emerging from this analysis is that land use strategies in marginal areas are aimed at dispersing local resources so as to minimize risks. (Tickes-Arizona)
W79-00797

DESERT TRANSFORMATION IN CHINA.
Academia Sinica, Taipei (Taiwan). Dept. of Desert Research.
Scientia Sinica, Vol. 21, No. 2, p 251-278, March-April 1978. 18 tab, 3 ref.

Descriptors: *Deserts, *Dunes, *Shelterbelts, *Range management, *China, Sands, Grazing, Irrigation practices, Pasture management, Vegetation establishment, Water conservation, Land conservation, Biomes, Terrestrial habitats, Climatic zones, Forest management, Reservoir construction, Drainage systems, Land reclamation, Irrigation canals.

Desert areas in China are situate mainly in the northern parts of the country and cover and area of 1,095,000 Km2, accounting for 11.4% of the total land area. Various degrees of desertification adre found in the PRC due mainly to the numerous bioclimatic zones. Accordingly, several management approaches have been developed and applied to localized areas. For instance, shelterbelts of trees and grsses have been applied in sandstorm areas to anchor the sand and protect natural vegetation. pasture in themore humid stepe zones are carefully protected from overgrazing by nomadic animals, and desert areas with more abundent water and land resources have been chosen for construction of major engineering works such as reservoirs, canals and irrigation and drainage systems. Recent efforts include the most modern desert-adapted cultural practices and techniques. Previously barren and unusable land is now being used productively in China while further efforts in this direction continue at a raped pace. (Tiches-Arizona)
W79-00798

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
S. Selvalingam, and A. Masood.
Water Resources Bulletin, Vol. 14, No. 4, p 827-841, August, 1978. 11 fig, 6 ref.

Descriptors: *Streamflow, *Channel flow, *Model studies, Flow, Hydrographs, Simulation analysis, Rainfall-runoff relationships, Structural models, Analytical techniques, Theoretical analysis, Indus River, Pakistan, Snowmelt, *Alteration of flow, *Routing, Evaluation, Upstream, Downstream.

Streamflow in three tributaries of the upper Indus River catchment in Pakistan, The Siran, Haro, and Soan is simulated in this analysis using two models the Synthesis and Reservoir Regulation model (SSARR) developed by the U.S. Corp of Engineers and the Tank model designed by Sugawara (1961). These models are also used here for channel-routing of the main stream for a stretch of about eighty miles. The SSARR model, developed in 1972, allows for the synthesis of streamflow by evaluation of snowmelt and rainfall and consist of two basic components: (1) a generalized river basin model for synthesizing runoff from rainfall, and (2) a river systems model for routing stremflows from usptream to downstream points through channel and lake storage. The tank model used here consists of several tanks laid out in either a vertical or parallel series with outlets and at the bottoms and sides, depending upon whether the area of application is humid or non humid. Data for the 1964-1970 period was used to verify basin characteristics that were derived through trial and error. Results showed the SSARR model to be superior in simulating low flows while the two models were of equal accuracy in the handling of high flows. (Thickes-Arizona)
W79-00800

SALINISATION IN THE SOUTHWEST OF WESTERN AUSTRALIA,
Western Australia Dept. of Conservation and Environment, Perth.
For primary bibliographic entry see Field 3C.
W79-00803

DESERT DEVELOPMENT IN THE V. I. LENIN KARAKUM CANAL ZONE,
Desert Inst., Ashkhadad (USSR).
A. Babaev, and Z. Freikin.
Social Sciences Today, Editorial Board, USSR Academy of Sciences, p 29-38, Moscow, 1977.

Descriptors: *Canal design, *Canal construction, *Conveyance structures, Water conservation, Channels, Water management, Arid lands, Deserts, Area redevelopment, Governmental interrelations, Political aspects, Agriculture, Economic justification, Social participation, Social impact, Community development, *USSR, *Karakum Canal.

The historical development of irrigation and land reclamation programand projects in the Soviet Union since 1918 are trced in an effort to illustrate that the scientific and technological revolution under developed socialism has facilitated the development of the deserts in the southern regions of the USSR. The planning, cinstruction and operation of one of these projects, the Karakum Canal, are discussed here in support ofthis thesis. First planned in 1906, this man-made canal now stretches for more than 1,000 Km. Bringing water from the Amudarya to virgin and old fallow land, the canal has made obsolate the once used shifting cultivation practices, facilitated livestock husbandry, and increased alfalfa sown land which replaces the previous noncultural farming based on cotton. Social, economic and political effects ofthe canal are discussed in this analysis to illstrate the strategies of the communist party and the Soviet government in managing the desert regions. (Tickes-Arizona)
W79-00805

NON-AGRICULTURAL LAND USE AND DESERTIFICATION,
Department of Environment, Housing and Community Development, Canberra(Australia).
P. Freer.
SEARCH, Vol. 9, No 7, p 276-280, July, 1978. 5 fig, 15 ref.

Descriptors: *Mining, *Recreation, Deserts, *Desertification, Mine wastes, Spoil banks, Mining engineering, Land management, Land reclamation, Reclamation, Recreation wastes, Economics, Project planning, Economic justification, Management, Social impact, Social aspects, Social participation, Arid lands, Water reuse.

Mining and recreational activities present a real and permanent danger to the biological productivity of arid regions throughout the world. Analized in this paper are the means by which these activities lead to desertification and alternative techniques to reverse these processes. Unlike other forms of land use, the initial effects of mining and recreation activities are localized and obvious, facilitating the developmet of plans to combat their environmental impact. Mining in Australia is an important economic activity, Accounting for 27% of her total exports. Major vegetation, access road construction and use, spoil dumps and human

activities associated with the mines. Techniques developed to manage affected areas are aimed at protection and stabilization of local ecosystems so that desertification is minimized. In arid Australia where tourism is popular, technicians have had to develop plans to reduce the pressure people are exerting upon local sites. These plans have included relocation of villages and roads, construction of viewing platforms, fences, and the reseeding of native but destroyed vegetation. The use of waste water in these rehabilitation efforts is of prime importance, both in the reduction of mine spoils and revegetation. Prompt planning and apropriate controls such as these have proven to be effective tools in reducing desertification processes caused by mining and recreational activities in Australia. (Tickes-Arizona)
W79-00806

WATERLOGGING AND SALINISATION IN IRRIGATED SEMI-ARID REGIONS OF NSW,
For primary bibliographic entry see Field 3C.
W79-00812

DESERTIFICATION IN THE PASTORAL RANGELANDS OF THE GASCOYNE BASIN, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Resources Management, Canberra (Australia).
For primary bibliographic entry see Field 3F.
W79-00814

THE EVOLUTION OF THE AUSTRALIAN DESERTS,
Sydney Univ. (Australia). Dept. of Geography.
T. L. Smith.
Arid Lands Newsletter, No 5, p 1-7, March 1977. 8 fig, 6 ref.

Descriptors: *Australia, *Playas, Lake basins, *Deserts, *Arid lands, *Geomorphology, Geologic history, Geologic formations, Geologic surveys.

Desertification, as it has affected one-third of the Australian continent, is discussed here not in terms of land management but rather in terms of natural history and environment. It is this author's belief that much of the desert encroachment in Australia could have been avoided with a better understanding of the Landforms present and their evolution; accordingly, a brief natural history of Australian desert landforms is presented followed by a discussion of the four principal types of deserts: the mountain deserts, shield deserts, stony deserts and sand deserts. Playas by the thousands dot the arid landscapes of Australia, usually dry, but occasionally full from unusual rains. Geologic evidence reveals that they were once larger and filled with permanent water. Having outlined and explained the distinctive features of each principal desert type, this author provides a brief geologic history of these formations from the late Jurassic period (ca. 150 to ca. 136 million years B.P.) to present. (Tickes-Arizona)
W79-00815

STRATEGY FOR THE DEVELOPMENT AND MANAGEMENT OF DESERTS.
Science and Public Policy, Vol. J, No. 1, p 56-62, Feb. 1978.

Descriptors: *Arid lands, *Deserts, *Land management, *Water resources development, Water management(Applied), Range management, Water conservation, Climatology, Social values, Technology transfer, Political aspects, Institutions, Planning.

Reported here are the recomendations of the Sacramento conference on alternative strategies for desert development and management (1977). Basic factors leading to desertification are defined as: (1) population growth resulting in increased flock size ad overgrazing, (2) destructive land and water management, (3) climatic variation as well as long-term change, and (4) social, politcal and cultural factors. Examples of desertification processes and technologies for improvement are presented from both developed and developing contries with emphasis placed upon the need to adapt existing technology to local conditions. Under the heading of water management specifically, recognition of the fact that institutional and political solutions as well as technological answeres must be sought was paramount. Long range planning for the beneficial use of fossil groundewater, techniques to maximize effective use of available water through improved irrigation techniques, evaporation control, salinity control ad drainage, ad water harvesting to maximize rainfall use, were discussed. (Tickes-Arizona)
W79-00818

DESERTIFICATION OF AUSTRALIA IN ITS GLOBAL CONTEXT,
New South Wales Univ., Kensington.
For primary bibliographic entry see Field 6G.
W79-00819

WATER LEVEL MEASUREMENT DEVICE,
C. B. Shuler, and W. E. Moore, Jr.
U.S. Patent No. 4,090,407, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 4, p 1239, May 23, 1978.

Descriptors: *Patents, *Water levels, *Measurement, Ultrasonics, Sound waves, Instrumentation, Electronic equipment.

The invention utilizes a technique of water level measurement including electronic and ultrasonic means. The device solves the problem of variable speed of sound by use of a fixed insert within a hollow, oblong structure which provides a standard by which comparison techniques may determine the accurate level of the water. The device comprises a hollow, oblong structure with an open end. The structure is secured with the open end in the water. A signal sending and receiving means is secured onto the hollow, oblong structure. An insert containing a hole is secured within the structure. The insert is operative to reflect a signal from the sending and receiving means back to the sending and receiving means through the structure. Portions of the signal pass through the hole in the insert without being reflected and proceed to be reflected by the water in the open end of the structure. Electronic means are connected to the signal sending and receiving means. The electronic means are operative to determine and compare the length of time the signal is sent and returned from the insert and from the water. From the comparison of the length of time the signal returned from the insert and from the water, the level of the water may be determined. (Sinha-OEIS)
W79-00822

ECONOMIC BENEFITS TO AGRICULTURE IN THE SAN JOAQUIN VALLEY DUE TO LONG-TERM PREDICTION STREAMFLOW FORECASTING,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 3F.
W79-00861

WHAT CONSTITUTES 'BENEFITS' FOR URBAN DRAINAGE PROJECTS,
Shoemaker and Wham, Denver, CO.
For primary bibliographic entry see Field 6B.
W79-00872

VISUAL LAND USE COMPATIBILITY AS A SIGNIFICANT CONTRIBUTOR TO VISUAL RESOURCE QUALITY,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional.
For primary bibliographic entry see Field 6B.
W79-00873

WORKING PAPER NOS. 7 - 10 OF THE EMERGENCY WATER ALLOCATION PROJECT, (7) IMPLEMENTATION OF A PREPAREDNESS PROGRAM; (8) ACHIEVING EQUITABLE AND EFFECTIVE WATER ALLOCATION; (9) RESTORATION OF A WATER DISTRIBUTION NETWORK; (10) IMPROVING EMERGENCY PREPAREDNESS,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
R. Schinzinger, H. Fagin, T. Edwards, and G. Urbach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 404, Price codes: A05 in paper copy, A01 in microfiche. November 1977. Working Paper No. 7, 15 p; Working Paper No. 8, 17 p; Working Paper No. 9, 28 p; Working Paper No. 10, 15 p. (California Water Resources Center Project UCAL-WRC-W-495). OWRT B-175-CAL(1).

Descriptors: *Water shortage, *Water supply, *Potential water supply, *Rationing(Water), Water management(Applied), California, Municipal water, Water distribution(Applied), Water allocation(Policy), *San Diego(Calif).

Communities which must rely on single sources of water are very vulnerable to disruptions of their sources. Many such communities are found in Southern California where long aqueducts, never too far from earthquake faults, constitute the main link to remote rivers and dams. The many considerations which arise indicate the need to prepare emergency plans before a disaster strikes. Working Paper No. 7 states the emergency problems and describes the development of an emergency plan for a particular agency. Working Paper No. 8 discusses alternative measures for allocation of water in an emergency. Rapid restoration of water service in a system which has incurred physical damage requires effective allocation of available personnel, equipment, and supplies to the needed repairs. Priorities among the repairs may vary from user criticality to the most efficient utilization of equipment. Working Paper No. 9 discusses different allocation policies from which may be selected the appropriate set which will match the pattern of disruption. Working Paper No. 10 discusses common causes of failure in organized response to disaster and presents preparedness activities designed to reduce the potential for failures in the emergency response system. (Snyder-Calif, Davis)
W79-00919

WORKING PAPER NO. 11 OF THE EMERGENCY WATER ALLOCATION PROJECT, MANUAL FOR WATER SERVICE EMERGENCIES FOR THE POWAY MUNICIPAL WATER DISTRICT,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
R. Schinznger, H. Fagin, T. Edwards, and G. Urbach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 343, Price codes: A05 in paper copy, A01 in microfiche. Working Paper No. 11, November 1, 1977, 85 p, 12 append. (California Water Resources Center Project UCAL-WRC-W-495) OWRT B-175-CAL(2).

Descriptors: *Water shortage, *Water supply, *Potential water supply, *Rationing(Water), Water management(Applied), California, Water allocation(Policy), *Water distribution(Applied), *San Diego(Calif), Poway Municipal Water Dist(Calif).

This manual provides guidelines to be used by the staff of the Poway Municipal Water District during

maor water service emergencies. It addresses problems which occur when service to a large portion of users is interrupted to the extent that the health and welfare of the community may be affected. Allocation of the available wate, restoration of service, and liaison with the community or with other agencies are but some of the tasks faced by District personnel during such an emergency. The purpose of this manual is partly to serve as a checklist or handbook of reference during periods of crisis, and partly to suggest measures and exercises in preparation for emergencies. (Snyder-Calif Davis)
W79-00920

AN OUTLINE FOR THE STUDY OF EMERGENCY WATER ALLOCATION PROCEDURES,
California Univ., Irvine. School of Engineering.
R. Schinzinger, and H. Fagin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 521, Price codes: A03 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Calif., Irvine, Working Paper No. 1, Aug 1976. 36 p, 5 fig, 4 tab, 65 ref. (Calif. Water Resources Center Project UCAL-WRC-W-498) OWRT-B-178-CAL(1).

Descriptors: *Water shortage, Water supply, *Potential water supply, *Water management(Applied), California, *San Diego(Calif).

This report describes the need and gives an outline of our study of contingency measures for water emergencies. It deals in particular with the San Diego area. (Snyder-Calif Davis)
W79-00921

A CONCEPTUAL MODEL OF THE WATER DELIVERY SYSTEM IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
R. Chee, and M. E. Slafkes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 482, Price codes: A02 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Calif., Irvine, Working Paper No. 2, August 1976. 9 p, 4 fig, (Calif. Water Resources Center Project UCAL-WRC-W-498). OWRT-B-178-CAL(2).

Descriptors: *Water supply, *Water shortage, *Water management(Applied), *Potential water supply, California, *Model studies, *Regional analysis, *San Diego(Calif).

This report presents a set of models which describes a regional water supply system. The models are useful in identifying concepts and relationships which apply to the normal operating mode as well as for emergency conditions. (Snyder-Calif, Davis)
W79-00922

THE CURRENT STATE OF EMERGENCY PLANNING FOR WATER SUPPLY IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
R. Chee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 468, Price codes: A02 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Calif., Irvine, Working Paper No. 3, July 1976. 10 p, 1 tab, 21 ref. (Calif. Water Resources Center Project UCAL-WRC-W-498). OWRT-B-178-CAL(3).

Descriptors: Water resources, *Planning, *Water shortage, *Water supply, Water management(Applied), Potential water supply, California, *San Diego(Calif).

This report describes the present state of planning for water supply emergencies in the San Diego area and how various agencies would be prepared to respond. (Snyder-Calif, Davis)
W79-00923

EMERGENCY WATER ALLOCATION LITERATURE: SOURCES AND RETRIEVAL,
California Univ., Irvine. School of Engineering.
M. E. Slafkes, and T. H. Edwards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 485, Price codes: A03 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Calif., Irvine, Working Paper No. 4, August 1976. 18 p. (Calif. Water Resources Center Project UCAL-WRC-W-498). OWRT-B-178-CAL(4).

Descriptors: Water resources, *Planning, *Water shortage, *Water supply, *Potential water supply, *Water management(Applied), Computer programs, California, *San Diego(Calif).

This report serves as a guide to the many printed and computerized sources of data and abstracts, with special emphasis on topics related to emergency water allocation. (Snyder-Calif, Davis)
W79-00924

EWAP DATA ACCESS SYSTEM - A MANUAL FOR THE USE OF THE EDGE PUNCH CARD FILE,
California Univ., Irvine. School of Engineering.
R. Chee, and M. E. Slafkes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 418, Price codes: A02 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Calif., Irvine, Working Paper No. 5, August 1976. 10 p. (Calif. Water Resources Center Project UCAL-WRC-W-498). OWRT-B-178-CAL(5).

Descriptors: *Computer programs, Water resources, *Planning, *Water shortage, *Water supply, Potential water supply, Water management(Applied), California, *San Diego(Calif).

Documents pertaining to emergency water allocation procedures are identified and obstracted on edge-punch cards. These cards form the basis the EWAP Data Access System. This is a manual for use of the card file. (Snyder-Calif, Davis)
W79-00925

THE TRENTON WATER CRISIS OF 1975: IMPRESSIONS AND ANALYSIS,
California Univ., Irvine. School of Engineering.
M. E. Slafkes, H. Fagin, and R. Schinzinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 522, Price codes: A04 in paper copy, A01 in microfiche. Emergency Water Allocation Project, School of Engineering, Univ. of Caif., Irvine, Working Paper No. 6, July 1976. 60 p. (Calif. Water Resources Center Project UCAL-WRC-W-498). OWRT-B-178-CAL(6).

Descriptors: *Water shortage, Water resources, *Planning, *Attitudes, *Phychological aspects, Decision making, Social aspects, New Jersey, *Trenton(NJ).

This report on the water shortage which occurred in and around Trenton, New Jersey, in September 1975 is based on personal observations, newspaper stories, and official documents. A chronological account conveys the atmosphere of an emergency in which acts of generous assistance occur in the midst of confusion that inevitably accompanies any crisis involving a multitude of agencies. The reactions of the authorities, the public, and the press are probed in a brief analysis of events leading up to and following the failure of the pumps at the filtration plant. (Snyder-Calif, Davis)
W79-00926

A FLASH FLOOD AID - THE LIMITED AREA QPF,
National Weather Service, Fort Worth, TX. Southern Region.
For primary bibliographic entry see Field 2B.
W79-00994

WATER CONSERVATION INFORMATION DISSEMINATION DURING 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-01000

4B. Groundwater Management

A GROUNDWATER RECHARGE MODEL AND APPLICATION TO A SMALL WATERSHED,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 2F.
W79-00508

A PROPOSED REVISION OF KENTUCKY'S WATER RIGHTS LEGISLATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6E.
W79-00524

EVALUATION OF ULTRAVIOLET/OZONE TREATMENT OF ROCKY MOUNTAIN ARSENAL (RMA) GROUNDWATER (TREATABILITY STUDY),
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5D.
W79-00538

FEDERAL RESERVATION OF GEOTHERMAL RESOURCES,
R. M. Silver.
Natural Resources Journal, Vol. 18, No. 1, p 213-16, January, 1978.

Descriptors: *Geothermal studies, *Reservation doctrine, *Public lands, *Judicial decisions, Federal government, United States, Legislation, Steam, California, Legal aspects, Energy.

There have been recent developments in the area of federal reservation of geothermal resources. In 1977, the Ninth Circuit Court of Appeals held that geothermal resources are included in mineral reservations to the United States under the Stock-Raising Homestead Act (Act). Consequently, they are not subject to development by the owner of the surface estate. This case comment on United States v. Union Oil Company explores the court's reasoning in reaching its holding. The case arose when Union Oil sought to develop wells on land owned under the Act in order to produce geothermal steam for generating electricity. The Act grants surface ownership to private individuals while reserving mineral interests in the United States. In order to determine the extent of the reservation, the court examined the legislative history of the Act to reach its interpretation of the Act. The intent of the Act is to retain sources of energy for the government. This case significantly widens the definition of 'mineral interst.' The implications of the case could be great because geothermal resources may be in great demand for future energy needs. The Ninth Circuit decision is being appealed to the Supreme Court. (Quarles-Florida)
W79-00613

AVAILABILITY AND QUALITY OF GROUND WATER IN THE WINSTON AREA, DOUGLAS COUNTY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00620

POTENTIAL EFFECTS OF DEEP-WELL WASTE DISPOSAL IN WESTERN NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00625

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00627

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN NORTHERN LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00628

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN CENTRAL LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00629

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN PORTALES VALLEY, ROOSEVELT COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00630

WATER RESOURCES OF NORTHEAST NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00631

TOWARD A RATIONAL DEVELOPMENT OF ARTIFICIAL-RECHARGE RESEARCH,
Geological Survey, Lubbock, TX. Water Resources Div.
W. W. Wood.
In: Advances in Groundwater Hydrology: American Water Resources Associations, p 243-247, September 1976.

Descriptors: *Artificial recharge, *Groundwater recharge, *Water management(Applied), *Aquifer characteristics, *Water quality, Recharge wells, Injection wells, Chemical properties, Biochemical properties, Water chemistry, Water transfer.

Artificial recharge can be an effective water-management technique if the hydrogeologic conditions of the aquifer system are quantified and if rational design criteria are established. The successful application of artificial recharge depends upon the development of methods for evaluating the changes in aquifer characteristics in both the saturated and unsaturated zones as a function of chemical, biological, and physical changes associated with the introduction of foreign water into the subsurface environment. Also, additional methods need to be developed to predict resulting variations of water quality in time and space. (Woodard-USGS)
W79-00632

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977--VOLUME 2. TRUST TERRITORY OF THE PACIFIC ISLANDS, GUAM, AMERICAN SAMOSA, AND NORTHERN MARIANA ISLANDS.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00640

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977--VOLUME 1. HAWAII.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00641

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1977.
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00642

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1977.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00643

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1977.
Geological Survey, Lincoln, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00644

OCCURRENCE, QUALITY, AND AVAILABILITY OF GROUND WATER IN JONES COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 2F.
W79-00709

CALCULATION OF DAILY GROUNDWATER LEVELS IN SWAMPS USING METEOROLOGICAL DATA,
S. M. Novikov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 548, Price codes: A03 in paper copy, A01 in microfiche. Technical Translation 72-51102, Indian National Documentation Centre, New Delhi, 1976. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, Vol 126, p 48-64, 1965. 28 p, 3 fig, 6 tab, 8 ref.

Descriptors: *Groundwater, *Water levels, *Swamps, *Model studies, Mathematical models, Meteorological data, Precipitation(Atmospheric), Evaporation, Solar radiation, Soil water, Infiltration, Foreign research, Hydrology, USSR.

Further development and perfection of the method of calculating daily groundwater levels in undrained swamps using meteorological data were described. Special calculation graphs and examples of their practical application for calculating swamp waters in different types of swamp massifs were described. (Sims-ISWS)
W79-00715

SULFUR GAS REMOVING AND SOLID PARTICLE FILTER FOR WELL WATER,
For primary bibliographic entry see Field 5F.
W79-00821

INTERFERENCES IN TRACE CONTAMINANT REMOVAL BY ADSORPTION FROM WATER FOR GROUNDWATER RECHARGE,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-00858

ECONOMIC BENEFITS TO AGRICULTURE IN THE SAN JOAQUIN VALLEY DUE TO LONG-TERM PREDICTION STREAMFLOW FORECASTING,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 3F.
W79-00861

NITROGEN FERTILIZER MANAGEMENT OF A LEMON ORCHARD AS RELATED TO NITRATE-POLLUTION POTENTIAL OF GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agriculture Engineering.
For primary bibliographic entry see Field 5B.
W79-00899

COMPUTER ANALYSIS OF THE WATER BUDGET OF THE PROPOSED OAK OPENINGS NEW TOWN, LUCAS COUNTY, OHIO,
Toledo Univ., OH.
For primary bibliographic entry see Field 4C.
W79-00902

4C. Effects On Water Of Man's Non-Water Activities

A METHOD FOR ESTIMATING THE REGIONAL EFFECTS OF LAND USE ON RIVER-WATER QUALITY, SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-00622

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES.
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 7B.
W79-00711

THE USE OF BENTHIC MACROINVERTEBRATES AS INDICATORS OF LOGGING IMPACT ON STREAMS WITH AN EVALUATION OF BUFFER STRIP EFFECTIVENESS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
J. D. Newbold.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 434, Price codes: A06 in paper copy, A01 in microfiche. PhD Thesis, February 1977. 103 p, 81 ref, 5 append. (Water Resources Center Project UCAL-WRC-W-411) OWRT A-047-CAL(2).

Descriptors: *Benthic fauna, *Microorganisms, *Lumbering, Forest management, Invertebrates, Indicators, *Buffer strips, Streams, *California, Watersheds(Basins), Watershed management, Pri-

mary productivity, Clear-cutting, Sampling, Pollutant identification.

Benthic samples were taken from 83 stations in 55 streams in mountains of northern California between May and September 1975. Stations were in logged and unlogged watersheds, and above, in, and below reaches disturbed by logged road crossings. Nine streams in logged watersheds were not protected by buffer strips, while 14 had buffers from 3 to 60 m wide. There were both clear-cuts and selective logging, all at least one year old. Circumstantial evidence suggests that higher primary productivities in the logged streams are mainly responsible for the changes in benthic populations, but that scouring by logging debris during winter floods may also be important. (Snyder-Calif Davis)
W79-00898

COMPUTER ANALYSIS OF THE WATER BUDGET OF THE PROPOSED OAK OPENINGS NEW TOWN, LUCAS COUNTY, OHIO,
Toledo Univ., OH.
M. B. McAvey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 417, Price codes: A07 in paper copy, A01 in microfiche. Master's Thesis in Geology and Hydrogeology, March 1978. 133 p, 23 fig, 4 tab, 40 ref, 2 append. OWRT C-3082 (No 3682)(7).

Descriptors: *Hydrologic budget, *Water balance, Hydrology, *Computer models, Mapping, Discharge(Water), Land use, Drainage, Groundwater, Evapotranspiration, Evaporation, Runoff, Precipitation, Inflow, Dew point, Meteorology, Equations, Computer programs, Urbanization, Soil moisture, Water table, Surface-groundwater relationships, Surface discharge, Soil water movement, City planning, *Ohio.

The water budget for a proposed site of a new town near Toledo, Ohio, was calculated with the help of a computer assisted data analysis. Daily values of surface to groundwater outflows and groundwater storage were snythesized. Groundwater storage and material calculations were done using computer-drawn water table maps but with little success because of the large number of grid cells and relatively small number of observation points. A modified Weather Bureau equation using wind speed, temperature, dew point, and insolation data yielded estimates of daily lake evaporation and a preliminary estimate of evapotranspiration. The resulting annual total was 116% of precipitation. Seasonal adjustment factors which averaged 0.5 and reflected water availability were used to produce a balanced budget. A major component of the budget was atmospheric exchange which accounted for 59% of the output and all of the input. The only other significant term is surface outflow which is limited because of its controlling mechanism. Other factors are evapotranspiration and surface discharge resulting from groundwater flow to man-made drainage ditches. It is concluded that the area is poorly suited to urbanization and other extensive use because of the high risk of groundwater flooding in the spring and the need for large volumes of imported water in the fall. These problems result from the limited storage capacity of the reservoir, high soil conductivity, inadequate surface drainage, and high rate of evapotranspiration. (Majtenyi-IPA)
W79-00902

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH IN THE RALSTON CREEK WATERSHEDS,
Iowa Univ., Iowa City.
J. R. Barnard, and T. E. Croley, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 390, Price codes: A04 in paper copy, A01 in microfiche. Final Report, September 1977. 55 p, 15 fig, 13 tab, 55 ref. OWRT A-053-IA(4) and OWRT B-0550IA(1).

Descriptors: *Model studies, *Watersheds(Basins), *Urban runoff, Iowa City, Flood forecasting, Data collection, Mathematical models, Water policy, Water management, Economic impact, Flood damage, Flood data, Flood frequency, Hydrologic models, Urbanization, Projections, Social aspects, Cost analysis, *Ralston Creek Watershed(Iowa).

The impact of urban expansion on the hydrology of the small Ralston Creek watershed area in Iowa City, Iowa, was evauated using modeling techniques requiring extensive precipitation and runoff records. A very effective hourly precipitation data generation model was constructed and the IIHR Stanford Watershed model was calibrated for pre-urban and present conditions to estimate surfacial flows and alternative future develoopment. From the hydrologic model, backwater profiles and stage-discharge relations for selected points on the creek were translated into probability of flooding estimates. Evidence shows that as urban expansion spreads to upper portions of the watershed, the problem of flooding downstream increases. The effects of increased flood hazard on property values were examined and a survey of 61 households in the Ralston Creek was conducted. Aggregate social costs associated with urban expansion and flood hazard are estimated and policy implications are discussed. Primary questions to be answered are: (1) how can urban expansion proceed without increasing flood hazard; (2) what should be done about existing flood problems. (Majtenyi-IPA)
W79-00906

4D. Watershed Protection

KOLYMA WATER BALANCE STATION, MAGADAN OBLAST, NORTHEAST U.S.S.R.: UNITED STATES-SOVIET SCIENTIFIC EXCHANGE VISIT,
Forest Service (USDA), College, AK. Inst. of Northern Forestry.
C. W. Slaughter, and M. A. Bilello.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 616, Price codes: A02 in paper copy, A01 in microfiche. Special Report 77-15, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, May 1977. 71 p, 30 fig, 5 ref, 6 append.

Descriptors: Foreign research, *Alaska, *United States, *Research facilities, *Information exchange, *Hydrology, Water balance, Rivers, Watersheds(Basins), Permafrost, Snowpacks, Snow, Cold regions, Geological regions, Instrumentation, Equipment, Stream gages, Groundwater, Soil water, Precipitation(Atmospheric), *Exchange visits, *USSR, *Magadan Oblast(USSR), *Kolyma Water Balance Station(USSR).

Two US scientists visited Kolyma Water Balance Station (KWBS) in Magadan Oblast of northeast USSR during the last two weeks of August 1976. Under the auspices of the Joint US - USSR Agreement on Cooperation in the Field of Environmental Protection, this trip was undertaken to review current Soviet watershed hydrology research in a permafrost-dominated setting similar to that of central Alaska. Research objectives, instrumentation, and field practices were observed and discussed at KWBS. A series of proposals for future cooperation in high-latitude hydrology research and data exchange was prepared. (Sims-ISWS)
W79-00716

MANUAL FOR METHODS OF QUICKLY VEGETATING SOILS OF LOW PRODUCTIVITY, CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, MO.
F. W. Bennett, and R. L. Donahue.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 329, Price codes: A21 in paper copy, A01 in microfiche. Final Report, June 5, 1975. 484 p, 79 fig, 35 tab, 105 ref. EPA 68-01-2632.

Descriptors: *Sediment control, *Vegetation establishment, *Water pollution control, *Construction, Vegetation, Fertilization, Soils, Mulching, Runoff, Erosion, Water pollution, Environment, Erosion contol, Bank erosion, Rill erosion, Sheet erosion, Soil erosion, Soil management, Construction pollution control.

The study has produced a user's manual for the 50 states on latest methods and procedures for establishing dense stands of perennial vegetation on soils of low productivity that have been disturbed by construction activities, will hold the soil in place, and thus will minimize water pollution by sedimentation. The manual defined common ground, in a practical and applied way, among many technical disciplines. The sciences of soil, geologic material, and plant growth were defined and related. Emphasis of the manual was on vegetating soils that are naturally low in productivity. Soil Great Groups that fit this criteria representing 39% of the United States land area were discussed. The soil and plant research of many professional scientists was related and brought into focus. Demonstration sites at 10 locations were characterized and documented. (Sims-ISWS)
W79-00717

ECONOMIC ANALYSIS OF EROSION AND SEDIMENTATION, SEVEN MILE CREEK SOUTHWEST BRANCH WATERSHED,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-00791

DESERT TRANSFORMATION IN CHINA.
Academia Sinica, Taipei (Taiwan). Dept. of Desert Research.
For primary bibliographic entry see Field 4A.
W79-00798

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W79-00813

THE USE OF BENTHIC MACROINVERTEBRATES AS INDICATORS OF LOGGING IMPACT ON STREAMS WITH AN EVALUATION OF BUFFER STRIP EFFECTIVENESS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 4C.
W79-00898

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH IN THE RALSTON CREEK WATERSHEDS,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 4C.
W79-00906

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

COLORIMETRIC ANALYSIS OF AMMONIA IN WATER,
American Univ., Washington, DC. Dept. of Chemistry.
F. W. Carson, and R. L. Gross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 301, Price codes: A02 in paper copy, A01 in microfiche. Washington Technical Institute Water Resources Research Center Report No. 11, February 1977. 8 p, 21 fig, 13 ref. OWRT A-003-DC(1).

Descriptors: *Ammonia, *Analytical techniques, *Colorimetry, *Chemical analysis, Chemical reactions, Analysis, Pollutants, Aqueous solutions, Water chemistry, Organic compounds, Measurement, Testing procedures, Automation.

An accurate, reliable method of determining concentration of ammonia in water solution was developed using colorimetric techniques. The procedure involves formation of a colored complex of ammonia with 2,5-dimethoxyoxolane and (E)-p-dimethylamino-cinnamaldehyde. This intensely blue complex has an alpha sub max of 630 nm and an extinction coefficient of 45,200 at a concentration of approximately 2 x 10(-5)M. The color forms in about 6 minutes and has a half-life of 7.8 hours. The procedure takes only about 3 minutes per analysis for multiple samples and involves a standard error of only 3%. Also, the method is suitable for automation. The lower limit of ammonia concentration is 10(-4)M but this could be reduced to 10(-6)M by increasing cell path to 10 cm and by using a spectrophotometer with an expanded scale of 0-0.1 absorbance units. (Majtenyi-IPA)
W79-00503

BIOLOGICAL CONTROL OF BLUE-GREEN ALGAE,
Nebraska Univ., Lincoln. School of Life Sciences.
E. L. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 311, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Research Institute Technical Completion Report, June 1976. 16 p, 11 fig, 7 tab. OWRT A-033-NEB(1).

Descriptors: *Cyanophyta, *Algal control, *Aquatic algae, *Lakes, *Algicides, *Eutrophication, Control, Water resources, Biological control, Recreation, Viruses, Plant viruses, Biocontrol, Microbiology, Nebraska, Scenery.

Three forms of blue-green algae, which detract from beauty and recreational value and accelerate eutrophication of many flood-control lakes in eastern Nebraska, have been isolated. Two filamentous forms, Aphanizomenon and Anabaena, and a unicellular Microcystis have been isolated in confluent, unialgal cultures; Microcystis has been isolated also in axenic culture. A search for naturally-occurring viruses and bacteria capable of selectively attacking these bloom-causing strains of algae has yielded several candidates. Two possible bacterial control agents were found and isolated in pure form. One was identified as a species from the genus Alcaligenes, and the other as a member of the Actinomycetes group. Studies on the mechanism of lysis indicate that the Actinomycetes appear to be able to express its lytic activity via an extracellular chemical but the Alcaligenes requires cell-to-cell contact with blue-green algal cells. A possible viral control agent has been isolated also and appears to be a new virus which was well characterized. This virus is specifically lytic to strains of Microcystis and Synechococcus. A second viral control agent was recently isolated but has not yet been well characterized. (Majtenyi-IPA)
W79-00509

NUTRIENT INPUTS AND ALGAL BLOOMS IN IOWA LAKES,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5C.
W79-00510

SOILS AS A FACTOR IN THE FORMATION OF WATER CHEMICAL COMPOSITION AND BENTHIC COMMUNITIES IN SMALL RIVERS OF THE DESNA BASIN, (IN RUSSIAN),
Inst. Hydrobiol., Acad. Sci. Ukr. SSR Kiev, USSR.
For primary bibliographic entry see Field 2K.
W79-00520

EFFECTS OF ANTIMYCIN ON STREAM INSECTS,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-00525

PREDICTION OF HEAVY METAL UPTAKE BY MARSH PLANTS BASED ON CHEMICAL EXTRACTION OF HEAVY METALS FROM DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W79-00548

A QUANTITATIVE STUDY OF THE PHYTOPLANKTON OF THE RIVER AVON, BRISTOL,
Ankara Univ. (Turkey). Dept. of Systematic Botany.
For primary bibliographic entry see Field 5C.
W79-00568

RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 5B.
W79-00570

NITRATE-NITROGEN IN EFFLUENT FROM AGRICULTURAL TILE DRAINS IN CALIFORNIA,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5B.
W79-00574

DIFFERENCES IN PRODUCTIVITIES BETWEEN THE GREAT AUSTRALIAN BIGHT AND THE GULF OF CARPENTARIA, AUSTRALIA, IN SUMMER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W79-00579

INFLUENCE OF METHODOLOGICAL FACTORS ON PLATE COUNTING OF AQUATIC BACTERIA: II. INCUBATION TIME (IN SPANISH),
Instituto Nacional de Limnologia, Santo Tome (Argentina).
F. Emiliani.
Rev Latinoam Microbiol 18(4), p 209-216, 1976.

Descriptors: Reviews, Analytical techniques, *Bacteria, *Pollutant identification, Incubation, *Water sampling.

After reviewing previous papers published on this theme from 1924-1974, the author demonstrates, through mathematical analysis, the importance of incubation time on plate counting.--Copyright 1978, Biological Abstracts, Inc.
W79-00580

EFFECT OF MACROPHYTES ON SOME HYDROCHEMICAL INDICES OF SHALLOW AREAS OF THE KREMENCHUG RESERVOIR (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
A. I. Merezhko, A. K. Ryabov, and G. V. Tsytsarin.
Gidrobiol Zh 13(3), p 111-115, 1977.

Descriptors: Aquatic plants, *Calcium ions, *Ions, Oxygen, Photosynthesis, *Bioindicators, Hydrogen, Pollutant identification, Water chemistry.

Data are presented on the effect of higher aquatic plants on the hydrochemical regime of shallow waters. A change in concentration of H ions in the medium was determined by photosynthesis activity in plants. A relationship was established between content of Ca ions and plant photosynthesis. A positive effect of plants on O2 conditions of shallow waters was observed.--Copyright 1978, Biological Abstracts, Inc.
W79-00606

THE QUALITY ASSURANCE PROGRAM OF A NATIONAL LABORATORIES SYSTEM,
Geological Survey, Albany, NY. Water Resources Div; and Geological Survey, Reston, VA. Water Resources Div; and Geological Survey, Lakewood, CO. Water Resources Div.
B. A. Malo, W. A. Beetem, L. C. Friedman, and D. E. Erdmann.
In: Proceedings of the 4th Joint Conference on Sensing of Environmental Pollutants, held in New Orleans, Louisiana, November 6-11, 1977: American Chemical Society, p 345-347, 1978. 4 ref.

Descriptors: *Water quality, *Quality control, *Chemical analysis, *Laboratory tests, *Analytical techniques, Laboratory equipment, Data collections, Reviews, Evaluation, Costs.

A 'Standard Reference Water Sample' study of the U.S. Geological Survey Water Resources Division has been conducted for over 14 years with more than 40 participating laboratories throughout the world. Means of concentration values and their standard deviations are calculated to evaluate the precision of the participating laboratories as a group. When the values for quality control data generated by the laboratories system during the last 3 years were compared to the Standard Reference Water Sample data, only 11 percent of the results exceeded 1.5 standard deviations from the accepted values compared to an expected 14 percent. During 1976, 9.2 percent of the values fell outside 1.5 standard deviations. (Woodard-USGS)
W79-00621

GLOBAL DISTRIBUTION OF CARBON DIOXIDE DISCHARGERS, AND MAJOR ZONES OF SEISMICITY,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, El Paso, TX. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-00637

HYDROLOGIC RECONNAISSANCE OF TSALA APOPKA LAKE, CITRUS COUNTY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00639

ICHTHYOLOGICAL AND HYDROLOGICAL OBSERVATIONS AND STUDIES ON YARINA COCHA, NEAR PUCALLPA AND ON THE RIO PACAYA (CENTRAL AND LOWER UCAYALI, E PERU), (IN GERMAN),
Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (West Germany).
For primary bibliographic entry see Field 5C.
W79-00668

OCCURRENCE, QUALITY, AND AVAILABILITY OF GROUND WATER IN JONES COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 2F.
W79-00709

ANALYSES OF AROMATIC HYDROCARBONS IN INTERTIDAL SEDIMENTS RESULTING FROM TWO SPILLS OF NO. 2 FUEL OIL IN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology; and Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
J. M. Teal, K. Burns, and J. Farrington.
Journal of the Fisheries Research Board of Canada, Vol 35, No. 5, p 510-520, May 1978. 6 fig, 4 tab, 33 ref. From: Proceedins of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Sediments, *Intertidal areas, *Oil pollution, *Weathering, Aromatic compounds, Water pollution effects, Ecosystems, Oil spills, Massachusetts, *Outer Continental Shelf, Hydrocarbons, *Buzzards Bay(Mass).

The two- and three-ring aromatic hydrocarbons were analyzed from the Wild Harbor oil spill in September 1969 and the Winsor Cove oil spill in October 1974, in intertidal marsh sediments, using glass capillary gas-chromatographic and mass-fragmentographic analyses. Naphthalenes with 0-3 alkyl substitutions and phenanthrenes with 0-2 substitutions decreased in concentration with time in surface sediments. The more substituted aromatics decreased relatively less and in some cases actually increased in absolute concentration. The changes in composition of the aromatic fraction have potential consequences for the ecosystem and provide insight into geochemical processes of oil weathering. (Sinha-OEIS)
W79-00719

RESIDUES OF BUNKER C OIL IN CHEDABUCTO BAY, NOVA SCOTIA, 6 YEARS AFTER THE ARROW SPILL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
P. D. Keizer, T. P. Ahern, J. Dale, and J. H. Vandermeulen.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 528-535, May 1978. 7 fig, 1 tab, 21 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Sediments, *Intertidal areas, Oil pollution, Environmental effects, Water pollution effects, *Outer Continental Shelf, Nova Scotia, Petroleum hydrocarbons, Aromatic hydrocarbons, Bunker C oil.

The Arrow spill in February 1970 heavily oiled approximately one half of the 600 km shoreline of Chedabucto Bay, Nova Scotia. An extensive field survey and chemical analysis of sediment samples for aliphatic and polycyclic aromatic hydrocarbons identified only a few locations where Arrow Bunker C remained in the intertidal and sublittoral sediments. The upper intertidal zones of Rabbit, Crichton, and Durell Islands remain covered with an oil and sediment mixture of a 'pavement-like' consistency. Several areas showed visual and chemical evidence of recent spills during the survey period. All sublittoral sediment samples contained hydrocarbons of petroleum origin. The distribution of the most highly contaminated sublittoral sediments suggests either reentry of stranded oil into the water column and into the sublittoral sediments or contamination from shipping and fishing vessels. Concentrations in the sublittoral sediments are below those found toxic to benthic organisms. An estimation of the amount of Bunker C remaining in Chedabucto Bay is impossible due to the patchy distribution, contributions of more recent spills, and the absence of adequate control sites. (Sinha-OEIS)
W79-00721

CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. S. Van Vleet, and J. G. Quinn.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 536-543, May 1978. 2 fig, 3 tab, 29 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Water pollution effects, *Sediments, *Oil pollution, Rhode Island, Environmental effects, *Outer Continental Shelf, Petroleum hydrocarbons, Biogenic hydrocarbons, Gulf of Maine.

Sediment cores from Narragansett Bay and Rhode Island Sound have been analyzed for petroleum hydrocarbons and compared with a relatively unpolluted sediment core from the Gulf of Maine. The sediments were analyzed for unbound hydrocarbons, hydrocarbons bound or closely associated with humic substances, and residual hydrocarbons bound or closely associated with the clay mineral or kerogen matrix. Results indicated that in general 90-100% of the hydrocarbons were in the unbound form and could be easily extracted with organic solvents. The petroleum hydrocarbons decreased with depth at all stations. Biogenic hydrocarbons made up an increasingly greater percentage of the total with increasing depth. The hydrocarbons in the Narragansett Bay sediments and near surface Rhode Island Sound sediments strongly resembled the hydrocarbons previously reported for the Providence River and upper Narragansett Bay. These petroleum-like hydrocarbons were shown to be largely introduced to the river and bay through chronic inputs from a municipal wastewater treatment plant. These hydrocarbons then undergo sedimentation throughout the entire bay and into Rhode Island Sound. Preliminary calculations indicate that over 0.2 million ton of petroleum hydrocarbons may be transported to the marine environment annually from municipal treatment plants. Most of these hydrocarbons appear to accumulate in estuarine and coastal sediments. (Sinha-OEIS)
W79-00722

PLANKTON COMMUNITY STRUCTURE: EVALUATION OF ANALYTICAL METHODS USING MODEL COMMUNITIES,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-00783

WILDERNESS WATER QUALITY: BISHOP CREEK BASELINE STUDY, 1974,
California Univ., Los Angeles. Environmental Science and Engineering.
For primary bibliographic entry see Field 5G.
W79-00859

SALMONELLOSIS IN MAN AND ANIMALS AS AN ENVIRONMENTAL HEALTH PROBLEM,
Purdue Univ., Lafayette, IN. Inst. of Environmental Health.
E. V. Morse, E. P. Myhrom, and D. E. Greenwood.
Journal Environment, Science and Health, A11(12), p 755-769, 1976, 1 tab, 67 ref. OWRT B-076-IND(2).

Descriptors: *Salmonella, *Water quality, Sewage bacteria, Water pollution, Water pollution sources, Public health, Human diseases, *Salmonellosis, *Food poisoning.

The Salmonella genus comprises over 1700 serotypes of pathogenic enteric bacteria. These microorganisms colonize in the intestinal tracts and mesenteric lymph nodes of man and lower vertebrates. Intra- and intergenus transfer of the infection(s) is cmmon. The disease in man and animals has not decreased during the last decade. Fecal contamination, by either symptomatic or occult carriers and shedders, is the primary transmission source of salmonellosis. The salmonellae problem and its possible resolution are intimately associated with the environment: waste disposal, including water and land use; food and feed processing, transportation and storage; livestock, poultry and dairy production; free-living and captive wildlife hosts as infection reservoirs; household pets and companion animals; various stress factors affecting man and food-producing animals; wholesale and retail marketing of fresh and frozen foods, and ultimately the consumer, including restaurants, involved in handling, preparation and storage of foods destined for the dinner table. Salmonellosis cannot be eradicated in the U.S. due to the environmental complexities of the problem. We can only hope for better preventive and control measures through greater effort in research, surveillance and education as well as awareness of the national problem.
W79-00865

SALMONELLA AS MONITORS OF FECAL POLLUTION IN THE AQUATIC ENVIRONMENT,
Purdue Univ., Lafayette, IN. Inst. of Environmental Health.
E. V. Morse, and M. A. Duncan.
Journal of Environment, Science and Health, A11 (10 and 11) p 591-601, 1976, 3 tab, 15 ref. OWRT-B-076-IND(1).

Descriptors: *Salmonella, *Sewage bacteria, *Water quality, Enteric bacteria, Water pollution, Mussels, Fish, Sediments, *Pollutant identification, Fecal pollution.

Polluted river water, river bottom sediment, fish body slime, fish gastrointestinal tracts and fresh water mussel gastrointestinal tracts were examined for Salmonella. Eleven serotypes were found among 131 isolates. S. amsterdam was the predominating Salmonella spp., and was obtained from all specimens. Two serotypes, give and senftenberg, were found only in the fish gastrointestional tracts. Salmonella may colonize in fish and serve as an indicator system for current as well as retrospective evidence of fecal pollution of the aquatic environment.
W79-00867

TRACE ELEMENT STUDY AT A PRIMARY COPPER SMELTER, VOLUME 1,
Radian Corp., Austin, TX.
K. Schwitzgebel, R. T. Coleman, R. V. Collins, R. M. Mann, and C. M. Thompson.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 935, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/2-78-065a, March 1978. 61 p, 15 fig, 21 tab. 68-01-4136.

Descriptors: *Air pollution, *Trace elements, *Toxicity, *Inustrial wastes, *Arsenic, *Electrostatic precipitation, Sampling, Evaluation, Molybdenum, Design standards, *Pollutant identification, Arsenic trioxide, Copper smelting.

A sampling study was carried out at a copper smelter, with a production rate of 200 tons of copper a day, with special emphasis on the performance of the electrostatic precipitator in collecting particulate matter escaping from the reverberatory furnace. Element balance of the reverberatory furnace showed that nearly all molybdenum is trapped in the slag; however, only 1/4 of the 190 lb/hr of arsenic entering the furnace is discharged with slag. About 1/4 of total arsenic is transported with the matte to the converters and about 1/2 leaves the furnace with the flue gas. Studies on the electrostatic precipitator led to the conclusion that particulate emissions are controlled with 96% efficiency at the 600 F operating temperature as specified in the design; however, appreciable amounts of toxic trace elements pass through the precipitator in the vapor state and condense to form particulate upon cooling. Arsenic trioxide was a major constituent of such vapor state emissions. (See also W79-00880) (Majtenyi-IPA)
W79-00879

TRACE ELEMENT STUDY AT A PRIMARY COPPER SMELTER, VOLUME 2, REPORT APPENDIX,
Radian Corp., Austin, TX.
K. Schwitzgebel, R. T. Coleman, R. V. Collins, R. M. Mann, and C. M. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 991, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/2-78-065b, March 1978. 131 p, 26 fig, 34 tab, 20 ref. 68-01-4136.

Descriptors: *Air pollution, *Trace elements, *Sampling, Analysis, *Industrial wastes, *Pollutant identification, X-ray fluorescence, Mass spectrometry, Arsenic, X-ray diffraction, Cadmium, Molybdenum, Lead, Antimony, Selenium, Zinc, Fluorine, Electrostatic precipitation, Copper smelting, Chemical analysis, Path of pollutants.

The details concerning sampling, sample analysis, and data evaluation are presented for a study made of trace element emissions of a primary copper smelter. During the evaluation of the electrostatic precipitor, the primary goal of the study, the parameters measured were: gas flow rate, gas composition, grain loading at inlet and outlet, particle size distribution, electrical performance, trace element material balance and flow rates as vapor, the amount of material condensible between gas temperature of 600 F and EPA recommended cool-off point of 250 F, and arsenic emission rates. Analytical procedures used to identify and quantify trace element emissions included x-ray fluorescence and spark source mass spectrometry. Results are tabulated for reverberatory furnace feed, impinger condensates, furnace slag, and incoming and outgoing electrostatic precipitator streams. Elements investigated include: arsenic, cadmium, molybdenum, lead, antimony, selenium, zinc, and fluorine. (See also W79-00879) (Majtenyi-IPA)
W79-00880

RELATIONSHIP BETWEEN CYTOPLASMIC DISTRIBUTION OF MERCURY AND TOXIC EFFECTS TO ZOOPLANKTON AND CHUM SALMON (ONCORHYNCHUS KETA) EXPOSED TO MERCURY IN A CONTROLLED ECOSYSTEM,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-00892

THE USE OF BENTHIC MACROINVERTEBRATES AS INDICATORS OF LOGGING IMPACT ON STREAMS WITH AN EVALUATION OF BUFFER STRIP EFFECTIVENESS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 4C.
W79-00898

A REPORT ON THE USE OF THE MACRORETICULAR RESIN XAD-2 TO ISOLATE PESTICIDES FROM THE CAPE FEAR RIVER,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. Harden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 564, Price codes: A05 in paper copy, A01 in microfiche. Ms Thesis, 1977. 90 p. 17 fig, 25 tab. OWRT A-073-NC(3), 14-31-0001-5033.

Descriptors: *Pesticides, *Macroreticular resins, *Resins, *North Carolina, *Cape Fear River(NC), Isolation, *Pollutant identification, *Monitoring, Water quality, *Pesticide residues.

A procedure for the monitoring of pesticides in natural waters was developed and utilized in a survey of the Cape Fear River Basin of North Carolina. Pesticides were adsorbed from aqueous solution onto the macroreticular resin XAD-2 and subsequently eluted with diethyl ether. The eluate was concentrated and then analyzed by electron capture gas chromatography. Reproducible, though rather low, recovery efficiencies were obtained by this method. Concentrations in the ng/l range were found in Cape Fear River samples for several pesticides. Trifluralin, DDT, and DDE were identified in most samples. The concentrations of DDT and DDE exceeded recommended limits in Water Quality Criteria 1972 for protection of aquatic life. (Kiger-North Carolina)
W79-00901

TOXICITY OF PERCHLOROETHYLENE, TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE AND METHYLENE CHLORIDE TO FATHEAD MINNOWS,
Dow Chemical Co., Midland, MI. Environmental Sciences Research Lab.
H. C. Alexander, W. M. McCarty, and E. A. Bartlett.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 344-352, 1978. 4 fig, 2 tab, 6 ref.

Descriptors: *Toxicity, *Bioassay, *Analytical techniques, *Minnows, Laboratory tests, Chemical properties, Mortality, Organic compounds, Gas chromatography, Water chemistry, Testing procedures, Evaluation, Fish behavior, *Toxicity testing, Static bioassay, Flow-through bioassay.

Static and flow-through fish toxicity tests were conducted on four chlorinated solvents: perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, and methylene chloride to demonstrate the significant difference between the static and flow-through toxicity values with highly volatile compounds. Flow-through tests provide information on toxic effects during continuous exposure of the organism to a constant concentration of a chemical while the static test provides one initial exposure of a nominal concentration. Oxygen is replenished, waste products removed, and fish are fed daily in the flow-through procedure. The static acute fish toxicity test is applicable when the compound is soluble in water and will remain in solution for a specified period of time. Because of the high volatility of the chlorinated solvents studied, the flow-through method was considered the appropriate test system. (EIS-Deal)
W79-00939

FIELD VERIFICATION OF CADMIUM TOXICITY TO LABORATORY DAPHNIA POPULATIONS,
Argonne National Labs, IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W79-00942

A PLANKTON NET DESIGNED TO EXCLUDE AIR-SEA INTERFACE PHENOMENA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 7B.
W79-00943

SENSITIVITY OF COASTAL WATERS TO ANTHROPOGENIC TRACE METAL EMISSIONS,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
P. A. Yeats, J. M. Bewers, and A. Walton.
Marine Pollution Bulletin, Vol. 9, p 264-268, 1978. 2 tab, 30 ref.

Descriptors: *Metals, *Water quality, *St. Lawrence River, *Water chemistry, Water analysis, Canada, *Monitoring, Iron, Manganese, Cobalt, Nickel, Copper, Zinc, Cadmium, Chemical analysis, Industrial wastes, Chemical wastes, Municipal wastes, Baseline studies, Geochemistry.

Trace metal concentrations in the waters of the Gulf of St. Lawrence and the Scotian Shelf and their sensitivity to changes in the composition of the major contributor of freshwater, the St. Lawrence River, are assessed. Comparison of the levels of trace metals in eastern Canadian coastal waters with those of other coastal waters of the world reveals that the former area generally has lower trace metal concentrations and is, therefore, probably less contaminated than elsewhere. The increased anthropogenic activity in the St. Lawrence drainage basin required to increase the levesl of trace metals in receiving coastal waters by detectable amounts is discussed. We demonstrate that faster and more reliable warning of changes due to anthropogenic activity will be revealed through river monitoring than through monitoring of coastal waters. Changes in the marine environment can then be assessed through a thorough understanding of the geochemical behavior of trace metals in nearshore waters. (EIS-Deal)
W79-00946

A SIMULATION MODEL FOR LEAD MOVEMENT IN A WATERSHED,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-00954

A TOXICOLOGICAL EVALUATION OF A PLASTIC OIL ABSORBANT,
Tromso Univ. (Norway). Inst. of Biology and Geology.
For primary bibliographic entry see Field 5C.
W79-00958

TOXICITY OF COPPER TO THREE ESTUARINE BIVALVES,
Centre of Advanced Study in Marine Biology Porot Novo (India).
For primary bibliographic entry see Field 5C.
W79-00974

Group 5A—Identification Of Pollutants

ANALYTICAL REPORT NEW ORLEANS AREA WATER SUPPLY STUDY.
Environmental Protection Agency, Dallas, TX. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 663, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-906/9-75-003, 92 p, June 1975. 2 tab, 1 app.

Descriptors: *Water quality, *Domestic water, *Water purification, *Water analysis, Organic compounds, Public health, Gas chromatography, Spectroscopy, Chemical analysis, Chemical properties, Analytical techniques, Baseline studies, Chlorides, Water treatment, Aromatic compounds, Herbicides, Pesticides, *Aliphatic compounds.

Detailed descriptions of sampling and analytical methods used to identify and quantify trace organic compounds present in the finished (i.e. treated) water of the New Orleans, Louisiana area wate supply, specifically the Carrollton Water Plant (City of New Orleans), Jefferson Parish No. 1 Water Plant (Metairie) and the Jefferson Parish No. 2 Water Plant (Marrero). Organic compound identification and concentrations and methods of analysis of carbon and resin extracts are presented. (EIS-Deal)
W79-00981

SPECIES DIVERSITY AND RELATIVE ABUNDANCE OF BENTHIC MACRO-INVERTEBRATES OF CEDAR CREEK BASIN, KANSAS,
Kansas State Teachers Coll., Emporia. Dept. of Biology.
J. D. Ransom, and C. W. Prophet.
Am Midl Nat. 92(1), p 217-222, 1974.

Descriptors: Basins, Benthic fauna, Biomass, *Cedar Creek Basin(Kan), Chironomidae, Diversity, Dugesia, Ephemeroptera, *Invertebrates, *Kansas, Production, *Species diversity, Sphaeriidae, Trichoptera, Water quality, Streams, *Cottonwood River(Kan).

A spring and summer environmental inventory was made on the Cedar Creek Basin, Kansas, and an 18-km stretch of the Cottonwood River downstream from its confluence with Cedar Creek. Environmental qualities of the major streams in the basin were determined by species diversity indices and relative abundance of benthic fauna. A total of 105 taxa was collected. Diversity index (d) values for Cedar Creek and its 5 major tributaries were all above 3, indicating that these streams had excellent water quality. There was a significant difference (P = .05) between the Cedar Creek Basin streams and the Cottonwood River, where the d values were all less than 3. Only 56 taxa were collected from the Cottonwood River stations. With few exceptions, the benthic fauna at all stations was dominated by Trichoptera, Ephemeroptera, Elmidae, Chironomidae, Sphaeriidae and Dugesia. Caddis flies (Trichoptera) and fingernail clams (Sphaeriidae) were the most important members of the benthic fauna, constituting 50% or more of the total ash-free biomass at most stations.--Copyright 1974, Biological Abstracts, Inc.
W79-00991

5B. Sources Of Pollution

TECHNICAL AND REGULATORY STATUS OF THE PLACEMENT OF SANITARY LANDFILLS IN IOWA,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5E.
W79-00502

FLUORIDE ACCUMULATION IN THE TERRESTRIAL AND AQUATIC COMPONENTS OF THE DOUGLAS CREEK DRAINAGE OF WESTERN MONTANA,
Montana Univ., Missoula. Environmental Studies Lab.
For primary bibliographic entry see Field 5C.
W79-00504

THE DALY POISONING OF MODERN MAN (IN ITALIAN),
Acad. Gioenia Sci. Nat., Catania, Italy.
For primary bibliographic entry see Field 5C.
W79-00519

STATISTICAL AND STOCHASTIC ANALYSES OF SYNTHETICALLY GENERATED URBAN STORM DRAINAGE QUANTITY AND QUALITY DATA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W79-00521

PRODUCTIVITY OF OEDOGONIUM IN LAKE WINGRA, WISCONSIN,
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00522

DEVELOPMENT OF COMPUTER PROGRAM FOR LINEARIZED SUBHYDROGRAPHS METHOD FOR URBAN RUNOFF DETERMINATION,
Akron Univ., OH. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W79-00526

POLLUTION IN RUNOFF FROM NONPOINT SOURCES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
K. L. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 279, Price codes: A04 in paper copy, A01 in microfiche. University of Florida Water Resources Research Center Publication No. 42, 1978. 49 p, 10 fig, 21 tab, 32 ref. OWRT B-023-FLA(1), 14-31-0001-5064.

Descriptors: *Nutrients, Water quality, *Nonpoint pollution, Mathematical models, Path of pollutants, Water pollution sources, *Nitrogen, *Phosphorus, *Fertilizers, *Agricultural runoff.

The increasing concern for the quality of our environment demonstrates the importance of gaining an increased understanding of the mechanisms and processes involved in nutrient movement from diffuse sources. In this study, nitrogen and phosphorus loads were determined for two agricultural watersheds: one primarily in native forest cover and the other primarily in intensive crop production. Small plots were used to evaluate the effects of selected cultural and water management practices on nitrogen and phosphorus loads in surface runoff from sandy soils. In both locations, nitrogen and phosphorus losses in runoff were very small compared with amounts received by the land area in precipitation and commercial fertilizer. Techniques were developed to simulate nitrogen movement through agricultural watersheds. Simulation models are an effective tool to assist in gaining a better understanding of the complex processes and interactions that occur in a watershed system. They can help in identifying which processes are most important in controlling nitrogen movement within a watershed. (Morgan-Florida)
W79-00527

EFFECTS OF SOIL INJECTION OF LIQUID DAIRY MANURE ON THE QUALITY OF SURFACE RUNOFF,
Kentucky Water Resources Research Inst., Lexington.
I. J. Ross, S. Sizemore, J. P. Bowden, and C. T. Haan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 278, Price codes: A05 in paper copy, A01 in microfiche. Research Report No. 113, 1978. 73 p, 43 fig, 1 tab, 1 ref. OWRT B-047-KY(1), 14-34-0001-6082.

Descriptors: Soil contamination, Soil management, *Soil moisture, *Soil treatment, Soil water, Soil water management, Soil water movement, *Farm wastes, *Injection, *Path of pollutants.

Liquid dairy manure has been injected on the soil contour to depths of 6 and 12 inches and applied to the surface of a Bluegrass sod and a bare tilled soil. Application rates of 9.250 gallons per acre were used. Runoff from 9-foot-square plots which were sprinkled at rates of 2.5 inches per hour on sod and 1.5 inches per hour on bare soil was collected and analyzed for various pollution parameters including COD, N, TSS, pH, DO, and fecal coliform. The effects of pollutant yield in the runoff have been determined for various treatments. Injection of the manure into the soil essentially eliminated any pollutant yield in the runoff from the test plots as compared with surface application. Also, injection tended to even the rate of pollutant loss in the runoff. Increasing the delay-time between application of liquid manure and the simulated rainfall event significantly decreased the yield of pollutants in the runoff. Repeated yearly applications of manure on sod reduced pollutant concentration in runoff and also reduced runoff rates. Test results indicate that pollutant concentration in runoff is a function of the concentration in the liquid manure and the total quality of runoff. (Huffsey-Kentucky)
W79-00528

INFLUENCE OF WATER AND FERTILIZER MANAGEMENT ON YIELD AND WATER-INPUT EFFICIENCY OF CORN,
Florida Univ., Quincy.
F. M. Rhoads, R. S. Mansell, and L. C. Hammond.
Agronomy Journal, Vol. 70, p 305-308, March-April, 1978. 2 fig, 4 tab, 9 ref. OWRT A-026-FLA(13), 14-34-0001-6010.

Descriptors: *Corn(Field), Infiltration, Trickle irrigation, *Herbicides, *Fertilizers, Soils, Kinetics, Herbicide sorption(Soils), Soil pH, Fertilization, Nutrient uptake, Soil water movement.

Damaging plant water stress develops in corn grown on coarse-textured, low water retaining soils of the southeastern U.S. during 1 to 2-week periods without rainfall. However, in most years rainstorms cause leaching of soluble fertilizers from the root zone. This study was conducted to evaluate efficiency of water input in terms of corn grain yield per unit of water, with two fertilizer application methods under three soil-water management systems on a Troup loamy sand (Grossarenic Paleudult). Water management consisted of (1) control - natural rainfall only, (2) trickle irrigation scheduled daily (0.64 cm/day), and (3) trickle irrigation scheduled by tensiometer (1.30 cm/application). Tensiometers were placed in each treatment at six depths between 15 and 150 cm below the soil surface and readings were recorded daily. Methods of applying fertilizers were designated (1) conventional - 1/3 of N and all P and K applied broadcast preplant, and remainder of N applied in two side-dressings; (2) program fertilization - N-P-K applied broadcast in small increments (5, 5, 10, 20, 20, 20 and 20%) at 2-week intervals after corn emerged. Average grain yields for the above water management treatments were 2,790, 4,160, and 5,700 kg/ha respectively. Conventional fertilization had an average grain yield of 3,680 kg/ha and program fertilization 4,760 kg/ha.

Water-input efficiencies based on grain yields and total water input were 57, 42, and 76 kg/ha/cm for no irrigation, daily irrigation, and tensiometer scheduled irrigation respectively. (Morgan-Florida)
W79-00530

MINERAL CYCLING IN SALT MARSH-ESTUARINE ECOSYSTEMS; ECOSYSTEM STRUCTURE, FUNCTION, AND GENERAL COMPARTMENTAL MODEL DESCRIBING MINERAL CYCLES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-00539

GEORGETOWN HARBOR, SOUTH CAROLINA; REPORT 1, HYDRAULIC SALINITY, AND SHOALING VERIFICATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-00540

PREDICTION OF HEAVY METAL UPTAKE BY MARSH PLANTS BASED ON CHEMICAL EXTRACTION OF HEAVY METALS FROM DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. R. Lee, R. M. Smart, T. C. Sturgis, R. N. Gordon, Sr., and M. C. Landin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A054 129, Price codes: A02 in paper copy, A01 in microfiche. Technical Report D-78-6, February 1978. 107 p, 18 tab, 14 fig, 48 ref, 2 append.

Descriptors: Zinc, Copper, Cadmium, Lead, *Heavy metals, *Marsh plants, Sampling, Waste disposal, *Dredged material, Plant populations, DTPA extraction, Absorption, Chromium, Nickel, Mercury.

Extensive field sampling of marsh plants and dredged material from U.S. Army Corps of Engineers disposal sites was conducted along the East and Gulf Coasts of the United States. Marsh plant species studies included Spartina alterniflora, Spartina patens, and Distichlis spicata. Four procedures for the extraction of heavy metals from soil were evaluated including water soluble, ammonium acetate exchangeable, dilute acid extractable, and DTPA extractable. Results indicated that most marsh plants colonizing dredged material disposal sites sampled in this study contained relatively low concentrations of Zn, Cu, Cd, Pb, Cr, Ni, and Hg. These concentrations were very similar to those reported for natural coastal marshes. In a few locations, however, the concentrations of Zn, Cu, Cd, and Pb in the marsh plants were an order of magnitude greater than the concentrations measured in the majority of marsh plants. DTPA extraction of heavy metals gave the best correlations with actual heavy metal concentrations in marsh plants. Marsh plant uptake of Zn, Cu, Cd, and, to some extent, Pb and Cr from dredged material can be predicted using a DTPA extraction procedure. (WES)
W79-00548

RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
D. R. Coote, and F. R. Hore.
Canadian Agricultural Engineering, Vol. 19, No. 2, December 1977, p 116-121. 6 tab, 21 ref.

Descriptors: *Feedlots, *Agricultural runoff, *Manure storage, *Suspended solids, *Water pollution sources, *Ontario, *Canada, Paving, Nutrients, Equations, Regression analysis, Cattle, Seasonal, Precipitation(Atmospheric), Forecasting, Agriculture.

Suspended solids was the most critical water quality parameter found during monitoring of quantity and quality of runoff from paved and unpaved cattle feedlots and paved solid and semi-solid manure storages in southern Ontario, Canada in 1973-75. Suspended solids concentration was significantly related to total solids; biochemical oxygen demand; total Kjeldahl, ammonia, nitrate, and nitrite nitrogen total phosphorus; and orthophosphate phosphorus. A procedure was developed for predicting runoff quantities from individual runoff events using regression equations of runoff on precipitations. A prediction procedure is also presented for water quality parameters. Runoff values (as percentages of precipitation after commencement of runoff) were lower for the feedlots studied than for similar sites in the midwestern U.S. Runoff water quality was more variable and less predictable than quantity, and no runoff was of acceptable quality for direct discharge to receiving waters. Statistically significant differences were found among the four sites monitored and between summer and winter runoff for most water quality parameters. Runoff volumes and water quality concentrations were combined to estimate nutrient losses from each site on a per-animal unit basis. Results can be used in volumetric design of runoff detention structures, and as a nutrient loadings guide for crop production systems incorporating land application of runoff. (Lynch Wisconsin)
W79-00570

CHANGES IN CARBON AND NITROGEN CONTENT DURING DECOMPOSITION OF THREE MACROPHYTES IN FRESHWATER AND MARINE ENVIRONMENTS,
Oakland Univ., Rochester, MI. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-00571

EFFECT OF THE CONCENTRATION OF NITROGEN COMPOUNDS ON MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznan (Poland). Inst. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-00572

NITRATE-NITROGEN IN EFFLUENT FROM AGRICULTURAL TILE DRAINS IN CALIFORNIA,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
J. Letey, J. W. Blair, D. Devitt, L. J. Lund, and P. Nash.
HILGARDIA, Vol 45, No 9, December 1977, p 289-319. 12 fig, 8 tab. NSF-RANN GI-34733X.

Descriptors: *Nitrates, *Nitrogen, *California, *Tile drainage, *Agricultural runoff, *Effluents, Water pollution sources, Nutrients, Fertilizers, Agriculture, Irrigation, Drainage, Soil types, Basins, Small watersheds.

Quantity and concentration of nitrate-nitrogen in tile drainage and its relationship to soil, crop, fertilizer inputs, and water application timing were determined for several California valleys. Tile drainage effluents were monitored at 55 sites on farms in the Imperial, Coachella, Ventura-Oxnard, San Joaquin, and Salinas Valleys. Questionnaires and personal interviews were used to obtain local information on land use, fertilizer applications, and irrigation. It was concluded that: (1) Nitrate-nitrogen concentrations in the tile effluent were not well-correlated with fertilizer application rate, effluent volume, or soil profile properties. (2) Amount of nitrate-nitrogen lost through tile effluent was well-correlated with total water discharge, fertilizer application, and soil profile characteristics; lowest amounts were associated with soil profiles having layers of clay or silty clay; the best correlation was between amount of tile effluent volume. (3) Alluvial soils in the western San Joaquin Valley contained significant native nitrogen, contributing both to high nitrate-nitrogen concentrations and total mass emissions in tile effluent. (4) Low nitrate-nitrogen concentrations and mass emissions occurred where alfalfa was the crop and no nitrogen fertilizer was used. (5) Soils with clay or silly clay layers had lower total nitrate-nitrogen emission, while highest losses were on sandy profiles receiving relatively high quantities of nitrogen fertilizer. (Lynch-Wisconsin)
W79-00574

PARTICULARATE ORGANIC MATTER IN SURFACE WATERS OFF SOUTHERN CALIFORNIA AND ITS RELATIONSHIP TO PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W79-00581

CHANGES IN THE CHARACTER OF MEADOW PLANT COMMUNITIES INDUCED BY THE OVERFLOW AND STAGNATION OF SALT WATER, (IN POLISH),
Polish Academy of Sciences, Krawkow. Inst. Uprawy Roli Roslin.
Fragm Florist Geobot (Cracow), 23 (1), p 68-76, 1977.

Descriptors: Agropyron-Repens, Atriplex-Hastatum, Var-Salinum, Calcium, Chlorides, Halophytes, *Poland, Potassium, Puccinellia-distans, Salts, Sodium, Soils, Spergularia-saina, Water pollution, *Salinity, *Saline water, *Salt mines, *Plant physiology, Plant growth.

The overflow and stagnation of salt waters coming from the Wieliczka (Poland) salt mine induced changes in the character of plant communities. Where saline waters stagnated longest the vegetation of meadows underwent total destruction, and artificial salt flat arose with soil of a high Na, Ci, Ca content. On the other hand, in the places over which salt waters ony flowed or impregnated the soil much smaller changes occurred in the chemical compostion of the soil and in the specific composition of the meadow plant communities. The areas most impregnated with salt were gradually dominated by such halokphilous species as Spergularia salina, Atriplex hastatum var. Salinum and Puccinellia distans. In places in which the influence of salt waters was of short duration, the percentage of haophytes in the meadow plant communities was much smaller and the predominat plants were of the alliance agropyro Rumicion Crispi with Agropyron repens as the dominat species. In the areas bordering the limit of salt waters the species typical of meadow communities survived, and the portion of nitrophilous plants amount them was only slightly greater. In unsodded places there appeared single specimens of p. distans. The latter plant occurred in all areas but varied in number, its quantity corresponding to the degree of soil salinity.- coyright 178, Biological Abstracts, Inc.
W79-00610

THE OTHER WATER POLLUTION (NONPOINT SOURCE POLLUTION),
K. Barton.
Environment, Vol. 20, No. 5, p 12-20, June, 1978. 1 tab.

Descriptors: *Water pollution sources, *Sediments, *Urban runoff, *Federal water pollution control act, Water pollution control, Pollutant identification, Agricultural runoff, Mining, Construction, Septic tanks, Landfills, Groundwater movement.

The 1972 Federal Water Pollution Control Act (FWPCA) requires control of nonpoint as well as point sources of water pollution. Nonpoint source pollution consists of all water pollution that is not released at one specific identifiable point. Approximately 50 percent of the nation's water pollution is estimated to be from nonpoint sources. The federal water pollution control program under the FWPCA has proven to be seriously inadequate in the nonpoint area. Nonpoint source pollution consists primarily of runoff. The Federal Environmental Protection Agency (EPA) groups nonpoint pollution sources into eight categories: (1) silviculture; (2) agriculture; (3) mining; (4) road and building construction; (5) saltwater intrusion; (6) subsurface excavations; (7) hydrologic modification; and (8) urban runoff. The major pollutant from nonpoint sources is sediment; agriculture runoff is its main source. Urban runoff is said to be as serious a problem as agriculture in many areas. Best management practices is the term used by the EPA for the various methods for reducing nonpoint pollution. The methods of control are as varied as the sources and several methods are examined. The article explores the theory behind the Clean Air Act and how it has been put into practice. (Quarles-Florida)
W79-00614

POTENTIAL EFFECTS OF DEEP-WELL WASTE DISPOSAL IN WESTERN NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
R. M. Waller, J. T. Turk, and R. J. Dingman.
Available from Supt. of Documents, GPO Washington, DC 20402, Price $1.90. Professional Paper 1053, 1978. 39 p, 18 fig, 5 tab, 36 ref.

Descriptors: *Model studies, *Underground waste disposal, *Injection wells, *Geochemistry, *Chemical reactions, Acids, Iron compounds, Hydrogeology, Aquifer characteristics, Hydraulic properties, Pressure head, Laboratory tests, On-site tests, Hydrofracturing, *Waste pickling liquor, *Steel industry, Western New York.

Mathematical and laboratory models were used to observe, respectively, the hydraulic and chemical reactions that may take place during proposed injection of a highly acidic, iron-rich waste pickle liquor into a deep waste-disposal well in western New York. Field temperature and pressure conditions were simulated in the tests. Hydraulic pressure in the middle stages of the initial (1968) injection test had probably hydraulically fractured the Cambrian sandstone-dolomite formation adjacent to the borehole. Transmissivity of the formation is 13 feet squared per day. The proposed rate of injection (72,000 gallons per day) of waste pickle liquor would approach a wellhead pressure of 600 pounds per square inch in about a year. Hydraulic fracturing would reoccur at about 580 pounds per square inch. The measurable cone of influence would extend about 22 miles after injection for 1 year. Chemical reactions between acidic wastes and brine-saturated dolomite would create precipitates that would drastically reduce the permeability of the unfractured part of the dolomite. Nondolomitic sandstone permeability would not be affected by chemical reactions, but the pores might be plugged by the iron-bearing waste. The digital model can be used for qualitative predictions on a regional scale. (Woodard-USGS)
W79-00625

NUMERICAL SIMULATION OF DISSOLVED SILICA IN THE SAN FRANCISCO BAY,
Geological Survey, Menlo Park, CA. Water Resources Div.; and National Oceanographic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorologica Labs.
For primary bibliographic entry see Field 2L.
W79-00635

PROCEEDINGS OF THE FIRST US/USSR SYMPOSIUM ON COMPREHENSIVE ANALYSIS OF THE ENVIRONMENT.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W79-00654

A COMPUTER MODEL OF THE POPULATION OF CHIRONOMIDS (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
G. V. Titarenko.
Zool Zh 56(4), p 530-537, 1977.

Descriptors: Biomass, *Chironomus-plumosus, *Computer models, *Energy flow, Food, *Mathematical models, Predation, Production, Weight, *Model studies, Distribution.

A mathematical model was constructed to represent the energy flow through a hypothetical population of Chironomus plumosus L. The model describes the state of the population as a numerical distribution of individual weights for every 5 days during the year. The weight growth rate depends on interspecific competition. Some characteristics of production dynamics as function s of the amount of food and the given: pressure of predators are biomass (B) production (P) and P/B. The model was produced on the computer.--Copyright 1978, Biological Abstracts, Inc.
W79-00659

EFFECTS OF A COASTAL FRONT ON THE DISTRIBUTION OF CHLOROPHYLL IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Div. of Environmental Studies.
M. R. Leigh-Abbott, J. A. Coil, T. M. Powell, and P. J. Richerson.
Journal of Geophysical Research, Vol 83, No C9, p 4668-4672, September 20, 1978. 8 fig, 13 ref. NSF DEB76-20341.

Descriptors: *Lakes, *California, *Nevada, *Chlorophyll, *Water temperature, On-site investigations, Sampling, Temperature, Winds, Data processing, Fluorescence, Coasts, Shores, Topography, Lake morphology, Limnology, *Lake Tahoe, Water fronts.

The existence of a distinct coastal zone was confirmed in Lake Tahoe (California-Nevada) by horizontal transects measuring chlorophyll and temperature simultaneously. Creation of the coastal region is influenced by bottom topography, the nature of the surface wind stress, and the difference between physical processes occurring within a Rossby radius of deformation and those occurring in midlake. Chlorophyll records from horizontal transects were decomposed by spectral analysis, and the normalized sectra from nearshore and midlake were compared. The two regions were found to differ at large scales, primarily because of differences in nutrient import, and at intermediate scales because of differences in the mixing regime. The coastal zone was observed to erode with increasing winds and weakening stratification, leading to little significant difference between nearshore and midlake chlorophyll patterns. (Sims-ISWS)
W79-00699

DISSIPATION OF HEAT FROM COOLING PONDS,
Bhabha Atomic Research Centre, Bombay (India).
R. S. D'Souza, and T. P. Sarma.
Indian Journal of Meteorology, Hydrology, and Geophysics, Vol. 28, No. 4, p 459-464, October 1977. 4 fig, 2 tab, 12 ref.

Descriptors: *Cooling water, *Ponds, *Heated water, *Model studies, Mathematical models, Temperature, Air temperature, Water temperature, Winds, Humidity, Heat, Heat flow, Heat transfer, Dispersion, Energy dissipation, Powerplants, Nuclear powerplants, *India, Heat dissipation, Cooling ponds.

A mathematical model was proposed for the planning of cooling ponds used for dissipation of waste heat from heated discharge waters of power generating stations. This dissipation of waste heat was found to be mainly dependent on wind speed and water temperature, was influenced negligibly by air temperature and humidity, and was independent of solar radiation. The model's special application is where the water resources are limited and recycling of water used for cooling the condenser waters of the power station is necessary. The models showed that the acreage requirements of the cooling ponds of such types of the order of 1.0 to 2.5 acres/Mw (e) during the hotter months at Bombay. Data were collected also at Tarapur Atomic Power Station's discharge channel, and the model calculations compared well with the actual temperature fall in the channel observed during low tide. (Sims-ISWS)
W79-00702

LONG-TERM FATE OF A HEAVY FUEL OIL IN A SPILL-CONTAMINATED B.C. COASTAL BAY,
Institute of Ocean Sciences, Sidney (British Columbia).
For primary bibliographic entry see Field 5C.
W79-00720

MEASURES AGAINST STORM WATER POLLUTION, (IN SWEDISH),
Chalmers Univ. of Technology, Goteborg (Sweden). Vatten Inst. Tek.
For primary bibliographic entry see Field 5G.
W79-00726

CHARACTERIZATION OF CONFINED DISPOSAL AREA INFLUENT AND EFFLUENT PARTICULATE AND PETROLEUM FRACTIONS,
University of Southern California, Los Angeles. Environmental Engineering Program.
J. C. S. Lu, Eichenberger, B. Kenezevic, and K. Y. Chen Miroslav.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-16, May 1978. 178 p, 8 tab, 29 fig, 19 ref, 3 append.

Descriptors: *Effluents, *Sedimentation, *Water quality, *Oil pollution, Influents, *Dredged material disposal, Dredged material, *Waste disposal sites, *Trace metals, Particulates.

Analyzes contaminants in influents and effluents from confined dredged material disposal areas at Pinto Island, Mobile Bay, Alabama, and Grassy Island, Detroit, Michigan. Samples were separated into 0.05-u, 0.45-u, and 8.0-u fractions. The total sample and filtrate were analyzed for metals, nutrients, total carbon, organic carbon, chlorinated hydrocarbons, oil ad grease, sulfide, and solids contents. Results show that, in general, the removal efficiency of total trace metals was similar to the total solids removal. These results agree with the analytical data which show that approximately 99% of the total trace metals was associated with the solid settleable phase (> 8-u). The total trace metal concentrations in the effluents at both disposal sites were significantly greater than the marine water quality requirements. Therefore, confined disposal operations will require either long detention times or treatment in order to meet applicable water quality stndards. On the other hand, it may be necessary to amend appropriate water quality criteria to differentiate the ecological significance of soluble and particulate fractions so that meaningful water quality criteria can be established.
W79-00763

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Southeast Environmental Research Lab., Athens, GA.
G. W. Bailey, R. R. Swank, Jr., and H. P. Nicholson.
J Environ Qual. 3(2), p 95-102, 1974.

Descriptors: *Agricultural runoff, Land use, Microorganisms, *Model studies, *Pesticides, Rainfall, Soil, Water pollution sources, *Forecasting, *Pesticide residues, Path of pollutants.

A mathematical model of the dynamic, single-rainfall-event type is being developed to describe quantitatively pesticide runoff as a function of pesticide and soil properties, agricultural practices watershed characteristics and climatic factors. From the model, guidelines governing pesticide use will be derived to prevent or minimize water pollution resulting from runoff from agricultural land. The model described is based on a state-of-the-art approach. Pesticide transport is 'piggybacked' on existing hydrologic and soil-loss models. Both direct mass-balance and area 1 averaging-statistical simulation approaches are being considered for the basic runoff and sediment transport descriptors. The conceptual structure of the overall model includes: source term effects (parameters that determine the initial concentration of pesticide available for runoff) e.g., pesticide formulation, physical-chemical properties and initial spatial distribution; loss of pesticide from the surface zone between rainfall events by various attenuation processes (volatilization, microbial, chemical, and photochemical degradation, and organism uptake); and loss of pesticide from the soil surface during runoff-producing rainfall events because of mass transfer from soil surface into the moving runoff film and pickup of sediment containing pesticide particulates. The minimum output requirements for the model are the prediction of runoff rate and sediment loading plus the corresponding water and sediment phase pesticide concentrations at a designated boundary (normally a watershed confluence or drainage channel) as a function of time during a runoff event. This output is to be based upon input consisting of the type, formulation, and rate and method of application of the pesticide, and the areal extent, topography, type of soil, cropping characteristic and rainfall characteristic of the watershed or basin. The model will internally generate and store the appropriate boundary condition changes required to predict sequential rainfall response using between-event meteorological data as input.--Copyright 1974, Biological Abstracts, Inc.
W79-00796

AN EXPERIMENTAL STUDY OF FLOW AND OXYGEN TRANSFER IN CIRCULATION INDUCED BY AIR BUBBLE PLUMES,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2E.
W79-00856

THE ADSORPTION-DESORPTION OF DIURON BY FRESHWATER SEDIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. E. Park.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 411, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, June, 1977, 48 p, 9 fig, 14 tab, 28 ref. (California Water Resources Center Project UCAL-WRC-W-485).

Descriptors: *Adsorption, *Desorption, Soil sciences, Pesticides, *Diuron, *Sediments, California, Organic carbon, Freundlich equation.

Freshwater sediments were collected from 8 locations in California to study their adsorption and desorption of diuron. The sediments were characterized as to physical and chemical properties using the same methods used for soils. The sediments have a range of organic carbon of .91 - 19% and are high in silt and clay. The organic carbon was correlated with CEC of organic matter and inversely correlated to pH and clay content. Most of the sediments had a C:N ratio equal to that of soils. The adsorption of diuron could be described by the Freundlich equation. Adsorption expressed as the Freundlich coefficient k, was correlated to the amount of organic carbon present. As the organic carbon increased, adsorption of diuron increased. There was no correlation with total CEC. The desorption of diuron was evaluated by taking the difference between the slope of the adsorption and desorption isotherms. These differences were positively correlated to k and organic carbon. As the difference between these slopes increased, the less diuron desorbed. Finally, adsorption was determined at two additional temperatures of 5C and 40C on 3 sediments. As the temperature increased, the adsorption of diuron decreased. (Snyder-Calif, Davis)
W79-00860

MATHEMATICAL MODEL FOR MULTIPLE COOLING TOWER PLUMES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
F. H. Y. Wu, and R. C. Y. Koh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 364, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-78-102, June 1978. 134 p, 25 fig, 34 ref, 3 append. EPA (5) R-803989-01-1.

Descriptors: *Path of pollutants, *Mathematical models, *Cooling towers, *Plumes, *Model studies, Environmental effects, Air pollution, Moisture, Humidity, Laboratory tests, Forecasting, Simulation, Hydraulic models, Estimating, Computer models, Liquid phase moisture, *Thermal pollution, Heat transfer, Temperature.

A mathematical model was developed for predicting properties of moist plumes emitted from cooling towers as a means of assessing environmental impact of these systems. The properties investigated include: excess plume temperature, humidity and liquid phase moisture (water droplet), plume trajectory, width, and dilution at the merging locations, and the beginning and ending points of the visible part of the plumes. Based on comparison with laboratory data, this model gives good predictions for the case of dry plumes where no moisture is involved; however, several empirical coefficients are not yet known accurately. Verification of this model for wet plumes, such as the prototype cooling tower plumes, and determination of the values for these empirical coefficients to be used in prototype applications must await detailed comparison with field data. (Majtenyi-IPA)
W79-00876

TRACE ELEMENT STUDY AT A PRIMARY COPPER SMELTER, VOLUME 1,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5A.
W79-00879

TRACE ELEMENT STUDY AT A PRIMARY COPPER SMELTER, VOLUME 2, REPORT APPENDIX,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5A.
W79-00880

LABORATORY AND FIELD MEASUREMENTS OF UPWELLED RADIANCE AND REFLECTANCE SPECTRA OF SUSPENDED JAMES RIVER SEDIMENTS NEAR HOPEWELL, VIRGINIA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
C. H. Whitlock, W. G. Witte, E. A. Gurganus, and J. W. Usry.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA TP-1292, Price codes: A03 in paper copy, A01 in microfiche. Report No NASA TP-1292, October 1978. 27 p, 10 fig, 3 tab, 6 ref, 1 append.

Descriptors: *Sediments, *Reflectance, *James River, *Suspended solids, Turbidity, Laboratory tests, Optical properties, On-site data collections, Model studies, Hopewell, Virginia, Ratio techniques, Remote sensing, Pollutants, Water pollution effects, Dredging.

Laboratory and field measurements of spectral reflectance characteristics were made of bottom sediments and water taken from the area near Hopewell, Virginia. Sediments taken from Bermuda Hundred and Bailey Bay were measured in the laboratory for total suspended solids concentrations between 4 and 173 ppm. Also, field measurements of spectral reflectance were made on water from the James River near Bermuda Hundred on two occasions. Results indicate that both Bermuda Hundred and Bailey Bay suspended sediments produce their strongest reflectance in the green and red regions of the spectrum and the general spectral characteristic of Bermuda Hundred suspended sediments is similar to that observed for the James River, with differences related to such factors as spectral resolution, algae content, and particle size distribution. However, the magnitude of reflectance values is quite different between laboratory and field results. Ratio techniques should prove useful for applying remote sensing data to distinguish Bailey Bay sediments from James River sediments in high turbidity plumes, as may occur in dredging. Improved laboratory procedures are needed to simulate spectral reflectance of natural waters in the laboratory and additional tests are recommended to develop and validate these procedures. Such simulations could aid in understanding the effects of adding pollutants and make possible remote sensing to detect pollutants in bottom sediments disturbed by dredging. (Majtenyi-IPA)
W79-00881

DOMES UPPER WATER PHYSICAL OCEANOGRAPHY, A COMPONENT OF THE DOMES PROGRAM,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
D. Halpern.
Deep Ocean Mining Environmental Study (DOMES) Final Report No. 26 (1978) 43 p 23 fig, 3 tab, 9 ref.

Descriptors: *Oceanography, *Baseline studies, *Resources development, Hydrography, *Deep Ocean Mining Environmental Study(DOMES), Ocean mining, Physical oceanography.

Although the primary environmetal impact produced by mining operations will be related to the chemistry and biomass of the region, accurate definition of the environmetal conditions is dependent upon sufficient knowledge of the physical oceanography. The objectives of the DOMES Upper WAter's Physical Oceanograpy component were determined in collaboration with the Principal Investigators of the DOMES Program at a meeting held in Seattle in October 1975. The Objectives were: description of vertical section of temperature, salinity ad density within the upper 1000 m; relative geostrophic curents from analysis of hydrographic measurements; Description of the temporal variability of currents at fixed-levels at each site; description of the thichness of the mixed layer; and description of the temporal variations of wind speed and direction at each site. Data are shown in charts and tables. (NOAA)

W79-00885

DISTRIBUTION AND COMPOSITION OF THE SUSPENDED PARTICULATE MATTER IN THE WATERS OF THE DOMES REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
E. T. Baker, R. A. Feely, J. Nevins, and K. Takahaski.
Deep Ocean Mining Environmental Study (DOMES) Revised Final Report No. 28. April 1978 64 p, 29 fig, 5 tab, 23 ref.

Descriptors: *Metals, *Baseline studies, *Resources development, Environmental effects, *Deep Ocean Mining Environmental Study(DOMES), Deep ocean mining, Suspended matter, Light scattering measurements, Trace metals, Particulate matter.

The DOMES (Deep Ocean Mining Environmental Studies) project is a multidisciplinary research effort designed to assess the marine environmental impacts resulting from commercial mining of deep-ocean manganese nodules. This report describes the results ofthe suspended particulate matter (SPM) program conducted during DOMES cruises RP-8-OC-75 (August 29 to October 16, 1975) and RP-8-OC-76 (February 11 to April 17, 1976) onboard the NOAA ship OCEANOGRAPHER. Light scattering measurements for the quantitative measurement of trace metals are tabulated. Difficulties of measurement are discussed. (NOAA)
W79-00886

TRACE METAL BASELINES IN THE DOMES STUDY AREA,
Washington Univ., Seattle. Dept. of Oceanography.
M. L. Healy.
NOAA/ERL, Pacific Marine Environmental Lab, Deep Ocean Mining Environmental Study (DOMES), Final Rept No. 27. July 1976. 8 p, 2 tab. 03-6-002-35117.

Although the nature and distribution of trace metals in the open ocean is yet open to question, the majority of recent determinations by modern techniques place their Concentrations in the subparts per billion range. The EPA standards (NAS, 1972) for seawater report the hazard level for certain metals as: Fe-300, Mn-100, Pb-50, and Cd-10 ppb. If the discharge plume concentrations from mining operations involve a dilution factor of 10 to the power of 3, and if the increases due to mixing observed in these preliminary data are representative, then it can be concluded that the increases in seawater trace metal concentrations due to the mining operations will be hard to detect. (NOAA)
W79-00887

NITROGEN FERTILIZER MANAGEMENT OF A LEMON ORCHARD AS RELATED TO NITRATE-POLLUTION POTENTIAL OF GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agriculture Engineering.
C. Pallares.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 570, Price codes: A06 in paper copy, A01 in microfiche. Doctor of Philosophy Dissertation, January 1978. 98 p. 15 fig, 21 tab, 66 ref, append. OWRT A-057-CAL(1).

Descriptors: *Citrus fruits, *Lemons, *Nitrogen, Nitrites, Groundwater, Irrigation effects, Fertilizers, Water pollution sources, Path of pollutants, California.

A replicated experiment was conducted in Ventura County, California on vigorous lemon trees (Limoneira 8a Lisbon lemon). Differential treatments were started in 1973 and continued through 1976. The objective was to develop nitrogen (N) fertilizer management practices that reduce the potential NO3 pollution of ground waters without having adverse effects on lemon fruit yield and quality. The treatments were designed to investigate the effects of rate, time and method of application on N usage and leaching by a lemon orchard under mulch and no-mulch conditions. Nitrogen balances were calculated. In the balance model, the N in the fertilizer and in the irrigation water were considered as inputs; outputs were N leached and removed in the fruit. Discrepancies between inputs and outputs were attributed to N mineralization from the organic pool, or N immobilization and gaseous losses of N. The N leached was calculated by multiplying the volume of drainage water by its NO3-N concentration at a 167-cm depth. The volume of drainage was estimated by a chloride balance model and measurements of the volume of irrigation water applied to the experimental block. (Snyder-Calif Davis)
W79-00899

A REPORT ON THE USE OF THE MACRORETICULAR RESIN XAD-2 TO ISOLATE PESTICIDES FROM THE CAPE FEAR RIVER,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-00901

CRISIS SCIENCE: INVESTIGATIONS IN RESPONSE TO THE ARGO MERCHANT OIL SPILL,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5C.
W79-00929

DISTRIBUTION AND ABUNDANCE OF BENTHIC MACROFAUNA IN THE SEWAGE SLUDGE DISPOSAL AREA, NEW YORK BIGHT APEX, FEBRUARY 1975,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
J. Pearce, J. Caracciolo, M. Halsey, and L. Rogers.
NOAA Data Report ERL MESA-36, November 1977. 38 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Benthos, *Sewage sludge, Sewage disposal, *Outer Continental Shelf, *New York Bight, Ecological distributions, Marine Ecosystems Analysis Program(MESA).

Sandy Hook Laboratory has been examining the impact of ocean waste disposal on the ecosystem of the New York Bight apex since 1968. The benthic community in the apex has been used to indicate impacts because certain bottom-dwelling organisms are often the first to be demonstrably affected by pollutants. The present data report was prepared in order to provide machine listed data and certain statistical calculations, diversity and equitability concerned with the distribution and abundance of benthic organisms found at 24 stations 'nested' within the sewage sludge disposal area of the standard N.Y. Bight, MESA sampling grid. These 'nested' samples will yield additional information on the impact of dumping in the New York Bight by providing a better distributional statistical base and will be used in comparisons with earlier data collected from the same area. (NOAA)
W79-00930

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK-NEW JERSEY OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
J. Pearce, J. Caracciolo, M. Halsey, and L. Rogers.
NOAA Data Report ERL MESA-30, December 1977. 79 p, 1 fig, 8 ref, chiefly tables.

Descriptors: *Benthos, *Baseline studies, *Resources development, Water pollution, Waste disposal, *Distribution, Abundance, *Outer Continental Shelf, *New York Bight, Ecological distribution, Ecosystems.

The Outer Continental Shelf Survey was undertaken to provide information on a large of the continental shelf beyond the 20 fm contour. The information obtained from benthic samples taken from this aea will be useful as a basis against which future changes in the ecosystem, due to natural or man-induced phenomena, can be evaluated. The five replicate grab samples from each station will provide a measure of within station variability. This data report was prepared in order to provide machine listed data and certain statistical calculations, diversity and equitability concered with the distribution and abundance of benthic organisms collected during the cruise. (NOAA)
W79-00931

TIDAL AFFECTED DISTRIBUTIONS OF SURFACE CHLOROPHYLL AND TRANSPARENCY IN THE NEW YORK BIGHT,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
D. R. Lyzenga, and F. C. Polcyn.
Final Report to NOAA, National Environmental Satellite Service, October 1977. 43 p, 18 fig, 3 tab, 9 ref. 04-6-158-44073.

Descriptors: *Chlorophyll, *Tidal effects, *Water quality, Remote sensing, Color, *Distribution, Outer Continental Shelf, *New York Bight, Transparency.

Multispectral data at two altitudes and two times of day were analyzed. The red/blue and red/green reflectance ratios appear to be useful indicators of chlorophyll and total particulate concentration (or Secci disk transparency) in water. The red/blue ratio technique is sensitive to atmospheric affects. Calculation of atmospheric effects using theoretical models is useful for lending insight into this problem. The second derivative technique holds promise as an indicator of water quality which is relatively insensitive to atmospheric effects. Further empirical and theoretical investigations need to be done with data from various altitudes and water types to establish the limitations of this technique. (NOAA)
W79-00933

POLYCHLORINATED BIPHENYLS, CHLORINATED PESTICIDES AND TRACE METALS IN SOILS OF THE EVERGLADES NATIONAL PARK AND ADJACENT AGRICULTURAL AREAS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
A. G. Requejo, R. H. West, G. R. Harvey, P. G. Hatcher, and P. A. McGillivary.
NOAA Technical Memorandum ERL AOML-32, October 1977. 45 p, 24 fig, 5 tab, 7 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Water pollution sources, Soils, Pesticides, *Florida, Copper, *Metals, *Trace metals, *Everglades, National Park(Fla).

Soil samples collected in May, 1976, from the eastern Everglades National Park and adjacent farmlands were analyzed for polychlorinated biphenyls (PCB's), certain chlorinated pesticides, and trace metals. The results indicate that although concentrations of PCB's, DDT's, Chlordane, and copper are high at agricultural sites, little horizntal movement of these compounds has occurred. In addition, black plastic is identified as the source of PCB's in the area, but the input of these compounds into the Park is minor. (NOAA)
W79-00934

THE AMOCO CADIZ OIL SPILL. A PRELIMINARY SCIENTIFIC REPORT,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.; and Environmental Research Lab., Narragansett, RI.
NOAA/EPA Special Report, 'The AMOCO CADIZ Oil Spill', April 1978. Wilmot N. Hess (Ed.) 354 p, 66 photos.

Descriptors: *Oil spills, *Water pollution effects, *Oil pollution, *Enviromental effects, Coasts, Beaches, France, *Biological effects, *Amoco Cadiz oil spill, Brittany.

A preliminary account of the United States (EPA and NOAA interagency oil spill response team) scientific efforts in response to the Amoco Cadiz oil spill during the period March 19 to May 15, 1978 is provided. Approximately 64,000 tons of oil came ashore along 72 km of the shoreline of Brittany during the first 2 1/2 weeks of the spill. A prevailing westerly wind pushed the oil against west-facing headlands and into shoreline embayments as it moved east. A wind reversa in early April moved the oil in the opposite direction, contaminating previously untouched areas. Coastal processes and geomorphology played a major role in the dispersal and accumulation of the oil once it came onshore. THe grounded mousse was either eroded away, or buried under new sediment deposits, in response to the vagaries of the beach cycle. A significant percentage of the oil is hypothesized to have sunk to the bottom and been subjected to bottom transport processes. Offshore, high concentrations of oil in water were observed, but near-bottom water usually contained even greater quantities of oil. Adverse biological effects of the spill were observed along the northwest coast of Brittany--a distance of about 150 km of coastline plus numerous rocky out croppings and islands. Mariculture operations for oysters were severely affected and intertidal communities on coastlines facing in a westerly direction were severely impacted. (NOAA)
W79-00935

IRON-ALGAE INTERACTIONS AS A FACTOR IN LAKE ERIE WATER QUALITY,
State Univ. of New York at Fredonia. Environmental Resources Center.
For primary bibliographic entry see Field 5C.
W79-00936

PREFERENTIAL ELIMINATION OF DIELDRIN BY SOME DIATOMS COMPARED TO CHLAMYDOMONAS AND SCENEDESMUS SPECIES,
Marburg Univ. (Germany, F.R.). Fachbereich Biologie.
D. Werner, and E. Morschel.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 3, p 313-319, 1978. 3 fig, 13 ref.

Descriptors: *Dieldrin, *Pesticide kinetics, *Chlamydomonas, *Scenedesmus, *Diatoms, Food chains, Absorption, Aquatic algae, Cytological studies, Path of pollutants, Radioactivity, Techniques, Tracers, Carbon radioisotopes, Pesticide toxicity, Metabolism, *Bioaccumulation, *Biomagnification.

Data was collected on the ability of several species of three genera of microalgae to eliminate the pesticide dieldrin. It was found that Nitschia was better able to eliminate dieldrin than Scenedesmus, which in turn was more efficient than Chlamydomonas. The results did not allow a generalization as to the level of algal classes. (EIS-Deal)
W79-00937

THE EFFECT OF LEAD ON OXYGEN UPTAKE IN THE CRAYFISH, ORCONECTES VIRILIS (HAGEN),
Northern Illinois Univ., De Kalb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-00941

SENSITIVITY OF COASTAL WATERS TO ANTHROPOGENIC TRACE METAL EMISSIONS,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W79-00946

AVIAN CHLOREA AND ORGANOCHLORINE RESIDUES IN AN AMERICAN OYSTERCATCHER,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
L. J. Blus, L. N. Locke, and E. Cromartie.
Estuaries, Vol. 1, No. 2, p 128-129, 1978. 8 ref.

Descriptors: *Pathogenic bacteria, *Pesticide residues, *DDE, *Animal diseases, Birds, Animal pathology, Bacteria, Cytological studies, Chlorinated hydrocarbon pesticides, pesticides, Path of pollutants, Organic compounds, Chemical analysis, South Carolina, *Cholera, *Avian chlorea, Pasteurella, Oystercatcher, *Tissue analysis, Cape Romain National Wildlife Refuge.

Pasteurella multocida, the causative bacterium of avian cholera, was isolated from cultures of the liver and heart blood of a female adult American oystercatcher found dead on the Cape Romain National Wildlife Refuge, South Carolina. This is apparently the first record of avian cholera in the oystercatcher. Also, low levels of DDE were identified in tissues of the oystercatcher. (EIS-Deal)
W79-00948

UPTAKE, DISTRIBUTION, AND ELIMINATION OF THE LAMPRICIDE 2', 5-DICHLORO-4'-NITRO(14C) SALICYLANILIDE (BAYER 2353) AND ITS 2-AMINOETHANOL SALT (BAYER 73) BY LARGEMOUTH BASS,
Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab.
D. P. Schultz, and P. D. Harman.
Journal of Agricultural and Food Chemistry, Vol. 26, No. 5, p 1226-1230, 1978. 3 fig, 5 tab, 6 ref.

Descriptors: *Bass, *Pesticide toxicity, *Lampreys, Organic compounds, Chemical properties, Chemical analysis, Toxicity, Pesticides, Salts, Techniques, Salts, Tracers, Radioactivity techniques, Carbon radioisotopes, Fish physiology, Animal metabolism, Absorption, *Lampricide, Bayer 73, Bayer 2353, *Tissue analysis, *Bioaccumulation, *Biomagnification.

In two groups of largemouth bass exposed to a 0.05 microgram/mL mixturee of the lampricide Bayer 2353 and its salt, Bayer 73 for 24 or 144 h, radioactivity was found in all tissues and organs analyzes. The concentration was highest in the gallbladder and lowest in the muscle. The actual amount of 140 material in the various tissues, when calculated as a percentage of the total in each fish, did not change significantly from one sampling interval to the next except for the bile and liver. Concentrations of 14C material in tissues and organs were dependent on the loading rate of the fish (weight per unit volume of water) in the exposure solution. In a third group of fish exposed to 0.05 micrograms/mL mixture of the lampricide for 24 h and then transferred to lampricide-free flowing water for as long as 14 days, the concentration of 14C material decreased with time in all organs and tissues except in the gallbladder x bile. There was little biomagnification of lampricide in the edible portion ofthe fish.
W79-00951

POLYCHLORINATED BIPHENYLS IN THE BIOMASS OF THE BALTIC,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
J. E. Kihlstrom, and E. Bergland.
Ambio, Vol 12, No. 4, p 175-178, 1978. 1 fig, 5 tab, 32 ref.

Descriptors: *Polychlorinated biphenyls, Organic compounds, Path of pollutants, Pesticide kinetics, DDT, Air pollution, Fallout, Commercial fishing, Fish physiology, Animal metabolism, *Biomass, Herrings, Biodegradation, Plankton, Commercial fish, *Tissue analysis, *Bioaccumulation, *Baltic Sea.

In spite of restrictions placed on the use of polychlorinated biphenyls (PCBs), some observations indicate that the concentrations of these substances in Baltic organisms have not yet decreased. In order to improve the understanding of this pollution problem the authors have drawn on recent research to estimate the total quantity of PCBs in the Baltic and clarify the ways these substances may be added to and removed from the Baltic ecosystem. There seems to be between two and three metric tons bound to the organisms, one ton of which is in fishes. Of this amount, 0.3 to 0.6 tons are removed annually in the commercial catch of fishes. The main source of the PCBs in the Baltic seems to be atmospheric fallout. According to the few data available this amounts to approxiately 6 tons per year. This factor may explain why concentrations are approximately the same throughout this area. Moreover, if the figures are correct, they indicate that the amounts of PCBSs in the Baltic might be increasing.
W79-00953

A SIMULATION MODEL FOR LEAD MOVEMENT IN A WATERSHED,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
G. L. Wheeler, G. L. Rolfe, and K. A. Reinbold.
Ecological Modelling, Vol. 5, p 67-76, 1978. 2 fig, 2 tab, 10 ref.

Descriptors: *Lead, *Path of pollutants, *Model studies, *Watersheds(Basins), *Soil contamination, Public health, Soils, Movement, Benthos, Illinois, Invertebrates, Heavy metals, Metals, Water pollution sources, Plants, Sediments, Environmental effects, *Automotive emission, Accumulations.

A simulation model of the movement and accumulation of automotively emitted lead in a watershed of Central Illinois is presented. The model is composed of four parallel terrestrial subsystems or zones based on traffic volume, and an aquatic system in series. The model x is used to estimate historical accumulations of lead within the watershed and to compare different scenarios of reductions of lead emissions. Since the introduction of leaded gasoline an estimated 570,000 kg of lead has been emitted in the watershed. Of this total about 36% remained airborne and left the watershed, and 3% left the watershed via the aquatic system. Lead is found to be a significant pollutant in urban areas and near major highways. Without emission controls lead is expected to cause environmetal problems after about 25 years.
W79-00954

THE EFFECT OF FENITROTHION ON REPRODUCTION OF A TELEOST FISH, CYPRINUS CARPIO COMMUNIS LINN: A BIOCHEMICAL STUDY,
Punjab Agricultural Univ., Ludhiana (India). Dept of Zoology and Entomology.
For primary bibliographic entry see Field 5C.
W79-00956

DOUNREAY OIL SPILL: MAJOR IMPLICATIONS OF A MINOR INCIDENT,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W79-00961

INFLUENCE OF DOMESTIC WASTES ON ENERGETIC PATHWAYS IN ROCKY INTERTIDAL COMMUNITIES,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W79-00969

METAL ACCUMULATION AND DEPURATION BY THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
R. A. Greig, and D. R. Wenzloff.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 499-504, 1978. 4 tab, 9 ref.

Descriptors: *Absorption, *Oysters, *Animal metabolism, Metals, *Silver, *Cadmium, *Copper, *Zinc, Animal physiology, Path of pollutants, Water pollution effects, Sediments, Water chemistry, Water quality, Water analysis, Bioaccumulation, *Depuration, Tissue analysis.

In the present report, accumulation and depuration of silver, cadmium, copper and zinc by oysters were studied in natural systems. Oysters were transferred from relatively unpolluted water to a polluted area in order to quantify accumulation of metals. The reverse was performed for the examination of depuration. Data on accumulation and depuration for each metal are presented and discussed. (EIS-Deal)
W79-00970

EVALUATION OF TOXICITY OF SOME INDUSTRIAL WASTES TO FISH BY BIOASSAY,
Shri Govindram Seksaria Technological Inst., Indore (India). School of Studies in Botany.
R. C. Trivedi, and P. S. Dubey.
Environmental Pollution, Vol 17, p 75-80, 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Toxicity, *Bioassay, *Industrial wastes, *Zinc, *Mercury, *Textiles, Water pollution sources, Water pollution effects, Mortality, Sulfates, Seasonal, Metals, Lethal limit, Sulfur compounds, Laboratory tests, Water quality, Barbus, Rayon industry.

Toxicities of effluents from caustic and rayon industries to fish (Barbus stigma) were determined by bioassay. Wastes diluted forty times were still found to be lethal. Zinc, mercury, sulphuric acid and organic matter were the main pollutants. The receiving river was found to be unfit for fish growth up to 35km downstream. Some treatments for such wastes are suggested, and the TLm values discussed. (EIS-Katz)
W79-00978

MERCURY AND THE ESTUARINE MARSH CLAM, RANGIA CUNEATA GRAY. II. UPTAKE, TISSUE DISTRIBUTION, AND DEPURATION,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00979

SUBSTITUTE CHEMICAL PROGRAM. INITIAL SCIENTIFIC REVIEW OF MSMA/DSMA,
Midwest Research Inst., Kansas City, MO.
T. L. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 566, Price codes: A00 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Pesticide Programs, EPA-540/1-75-020, 116 p, December 1975. 2 fig, 14 tab, 32 ref.

Descriptors: *Herbicides, *Pesticide toxicity, *Pesticide kinetics, *Pesticide residues, Chemical properties, Chemical analysis, 2,4,5-T, Toxicity, Path of pollutants, Arsenic compounds, Animal metabolism, Environmental effects, Public health, Organic compounds, *MSMA, *DSMA, *Bioaccumulation, *Biomagnification, *Tissue analysis.

The substitute chemical is reviewed for suitability considering all applicable scientific factors, such as chemistry, toxicology, pharmacology, environmental fate, and movement, use patterns, and efficacy. The major objective of this report is to cover all uses of MSMA/DSMA and is intended to be adaptable to future needs. MSMA/DSMA were identified as registered substitute chemicals for certain cancelled and suspended uses of 2,4,5-T. (EIS-Deal)
W79-00982

REPORT ON FY 1977 NUMERICAL MODELING IN PUGET SOUND,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
C. S. Smyth.
NOAA Technical Memorandum ERL MESA-30, June 1978. 52 p, 13 fig, 14 ref, 3 append.

Descriptors: *Model studies, *Path of pollutants, Floating, Washington, *Mathematical models, Simulation analysis, *Puget Sound(Wash), *Pollutant trajectory models.

A simple single-phase pollutant trajectory model and two basic components, a method for computing surface winds were developed for the Puget Sound region. The model simulates the motion of a number of discrete floting elements under the influence of surface currents, surface winds, and parameterized diffusion. The floating elements may be introduced from several (possibly moving) sources. The computed paths of these elemets approximate the paths that would befolowed by a single-phase floating pollutant. The model is operational and may be accesed bia voice-grade telefphone lines.(NOAA)
W79-00992

A STUDY OF THE SOURCES, TRANSPORT, AND REACTIONS OF SUSPENDED PARTICLES IN WATERS OF THE NEW YORK BIGHT,
University of South Florida, St. Petersburg. Dept. of Marine Science.
P. R. Betzer.
NOAA Technical Memorandum ERL MESA-23, February 1978. 40 p, 6 fig, 9 tab, 13 ref, append. 04-5-022-20.

Descriptors: *Water quality, *Suspended solids, *Water pollution sources, Chemistry, New York, *New York Bight, Suspended particles, Ocean dumping.

Eighty-six samples of suspended matter collected on five cruises to the New York Bight have been subjected to chemical analyses. The results demonstrate that some of the major inputs of particiulate matter to this system can be chemically typed and then traced. Seasonal changes in the distribution ad composition of suspended materials are related to (1) river input, (2) diatom productivity, (3) sediment-2ater interactions, and (4) the dumping of anthropogenic materials.(NOAA)
W79-00993

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W79-00999

5C. Effects Of Pollution

FLUORIDE ACCUMULATION IN THE TERRESTRIAL AND AQUATIC COMPONENTS OF THE DOUGLAS CREEK DRAINAGE OF WESTERN MONTANA,
Montana Univ., Missoula. Environmental Studies Lab.
C. C. Gordon, and P. C. Tourangeau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 277, Price codes: A04 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Ctr, Bozeman Completion Rpt No. 91, December 1977. 45 p, 23 fig, 1 tab, 24 ref. OSWRT A-070-MONT(1).

Descriptors: *Montana, *Douglas Creek, *Water pollution, *Fluorides, *Water pollution effects, *Aquatic environment, *Environmental effects, Pollutants, Metabolism, Aquatic insects, Trout, Diptera, Ephemeroptera, Industrial pollution, Phosphates, Fluoroapatite, Environmental studies, Sampling, Evaluation, Runoff, On-site investigations.

The accumulation of fluorides in terrestrial and aquatic components of Douglas Creek drainage in western Montana was investigated. Samples were collected from nine sites downstream or adjacent to a phosphorus plant located in the area, seven sites upstream from the plant, and one site on Flint Creek above the confluence with Douglas Creek. Samples included vegetation, sediment, aquatic insects, and water. Of the insects studied, those of the orders Ephemeroptera and Diptera which are herbivores, accumulated substantially more fluoride in their body tissues than those which belonged to carnivore or predator species. This indicates that contaminated foliage falling into Douglas Creek could contribute more fluoride to animals in the creek than fluoroapatite dust washed into creek sediment. Fluoride accumulation in tissues of trout species collected in both polluted and unpolluted sections of the creek demonstrated that a high level of variability occurs in both bone and skin tissues of trout. Although fluoride concentrations in bone and skin tissues of trout were excessively high, it is believed that fluoride pollution of this creek is chronic rather than acute. No evidence was found indicating that fluoroapatite dust reaching the creek during phosphate plant operations has caused any serious depletion in its productivity. There is evidence that the fluoroapatite in Douglas Creek is being diluted by washout. (Majtenyi-IPA)
W79-00504

SURVEY, ECOLOGY, AND SYSTEMATICS OF THE UPPER POTOMAC ESTUARY BIOTA: AUFWUCHS MICROFAUNA, PHASE II,
Georgetown Univ., Washington, DC. Dept. of Biology.
D. M. Spoon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 041, Price codes: A04 in paper copy, A01 in microfiche. Washington Technical Institute Water Resources Research Center Report No. 8, August 1976. 42 p, 22 fig, 11 tab, 8 ref. OWRT B-006-DC(1).

Descriptors: *Model studies, *Sewage effluents, *Sewage bacteria, *Aquatic bacteria, *Fishkill, *Potomac River, Activated sludge, Ecology, Environmental effects, Water quality, Microorganisms, Sewage sludge, Toxins, Protozoa, Water pollution sources, Microbiology, Estuarine environment, Oxidation, Pilot plants, Dissolved oxygen.

Two model rivers, representing Potomac River sites at Hains Point, Blue Plains Sewage Treatment Plant, Broad Creek, and Piscataway Creek connected to a common reservoir containing upriver water, were studied. Each model consisted of four 24-gallon aquaria. In one model at aquarium 2, frozen sewage was added, and in the other, dechlorinated tap water was added. Four attempts made to duplicate the May 1974 fishkill, which took place when river to sewage flow ratio was 20:1, failed: negative results were obtained with aquaria conditions representing river to sewage flow ratios of 20:1, 5:1, 1:1, and 4:4. It was concluded that the fishkill was caused by a toxin in the sewage and not a heat shock or toxin in the river. Dissolved oxygen sag curves in the river model closely approximated those at Potomac River sites at the same temperature. Other studies were done on a 50,000-gallon pilot activated sludge plant before and after hydrogen peroxide treatment of a bulking condition. A new method for counting and studying the activated sludge community was devised using thin plastic film (Handiwrap) coverslips with plastic slides. It was concluded that the protozoan community was little affected by the treatment. The oxygen-induced fragmenting of the filamentous bacteria allowed acanthamoeba to feed. Using tritiated thymidine, a food chain from bacteria to Spirostomum to the ostracod Cypridopsis was confirmed. Ecological studies are reported on the suctorian Lernaeophrya capitata and a list of protozoan and micrometazoan species cultured in the laboratory is provided. (Majtenyi-IPA)
W79-00506

NUTRIENT INPUTS AND ALGAL BLOOMS IN IOWA LAKES,
Iowa State Univ., Ames. Dept. of Animal Ecology.
R. W. Bachmann, and J. R. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 043, Price codes: A03 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report, June 1976. 31 p, 10 fig, 3 tab, 41 ref. OWRT A-049-IA(2).

Descriptors: *Algal control, *Plankton, *Eutrophication, *Aquatic algae, *Iowa, *Lakes, Water resources, Nuisance algae, Conservation, Chlorophyll, Ecology, Phosphorus, Phosphorus compounds, Nutrients, Water quality, Nitrogen, Surveys, Evaluation.

The development of excess growth of plankton algae in Iowa lakes and reservoirs was investigated in an attempt to learn factors controlling levels of algal chlorophyll and determine if reduction of algal populations is feasible. The sampling studies showed that, in 1975, the average chlorophyll concentration was 72 mg/cu m, causing a poor water transparency with Secchi disk value of about 0.9 m. Algal levels in a sample of 143 lakes were strongly correlated with concentrations of phosphorus. Also, the ratio of nitrogen to phosphorus in Iowa lakes averages 24.2, indicating that phosphorus is most likely the limiting nutrient for algal populations. For natural lakes, summer phosphorus concentration could be calculated using the equation TP -0.84L/z (sigma + rho), where TP is the concentration of total phosphorus in the lake water (mg/cu m), L is the annual phosphorus loading per unit area of lake surface (mg/sq m), z is the mean depth of the lake (m), sigma is the sedimentation rate (year (-1)), and rho is the hydraulic flushing rate. This relationship cannot be applied to artificial lakes, seemingly because of higher sedimentation coefficients. Considering that phosphorus loading to the natural lakes is from general runoff rather than point sources, banning phosphates from detergents of phosphate removal at sewage-treatment plants will not lower phosphorus levels. Because plankton algae growth is linked with phosphorus levels, the implication is that there is not much hope of improving the character of most Iowa lakes. (Majtenyi-IPA)
W79-00510

THE DALY POISONING OF MODERN MAN (IN ITALIAN),
Acad. Gioenia Sci. Nat., Catania, Italy.
G. Di Maggio.
Atti Accad Gioenia Sci Nat Catania 7(5), p 3-18, 1973.

Descriptors: Air pollution, Detergents, Drugs, Food additives, *Herbicides, *Industrial wastes, *Insecticides, *Organophosphorus insecticides, Radioactivity, Water pollution effects.

Various forms of pollution affecting man are reviewed. These include radioactivity, DDT and organophosphorus insecticides, herbicides, food additives, drugs, detergents and industrial wastes. The intake of foods, water and air containing these pollutants and their eventual effects on health are discussed.--Copyright 1978, Biological Abstracts, Inc.
W79-00519

PRODUCTIVITY OF OEDOGONIUM IN LAKE WINGRA, WISCONSIN,
Texas Christian Univ., Fort Worth. Dept. of Biology.
M. D. McCracken, T. D. Gustafson, and M. S. Adams.
Am Midl Nat. 92(1), p 247-254, 1974.

Descriptors: *Aerial photography, Algae, Carbon-14, Imagery, Lakes, Myriophyllum, Nutrients, *Oedogonium, *Productivity, Runoff, Sewer, Storm, Wingra(Wisc), Wisconsin, Absorption.

Productivity of the mat-forming alga Oedogonium was measured in the littoral zone of Lake Wingra, Wisconsin, for 2 seasons with a combination of techniques which included color IR imagery from aircraft, biomass harvesting and 14C uptake. Maximum productivity occurred in July, and was 32.3 mg C.day-1.m-2 lake (1972) and 2.06 g C.day-1.lm-2 algal mat (1971). Annual dry-matter production of Oedogonium in Lake Wingra was 6400 kg in 1971 and 11,500 kg in 1972. Algal mat development was related both to the presence of Myriophyllum and proximity to nutrient-rich runoff from storm-sewer entries to the lake.--Copyright 1974, Biological Abstracts, Inc.
W79-00522

MICROBIOLOGICAL STUDY OF A HYPERSALINE LAKE IN FRENCH SOMALILAND,
Centre Hospitalo-Universitaire-Poitiers (France). Bacteriology Virology Lab.
J. Brisou, D. Courtois, and F. Denis.
Appl Microbiol. 27(5), p 819-822, 1974.

Descriptors: *French Somaliland, Halobacterium-trapanicum, Halococcus-morrhuae, *Hypersaline lakes, Lakes, *Microbiology, Saline lakes, *Salts, Heterotrophic bacteria, *Euryhalines.

In a study of a lake having higher concentration of salts than the Dead Sea, all of the heterotrophic bacteria isolated were aerobes; no strictly anaerobic strains were found. Ninety percent of the strains were euryhalines and 10% were strict halophiles. The extreme halophiles belonged to the species Halobacterium trapanicum and Halococcus morrhuae.--Copyright 1974, Biological Abstracts, Inc.
W79-00523

EFFECTS OF ANTIMYCIN ON STREAM INSECTS,
Wisconsin Univ.-Madison. Dept. of Entomology.
P. M. Kotila, and W. L. Hilsenhoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 336, Price codes: A04 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC 78-05, 1978. 55 p, 8 fig, 10 tab, 196 ref. OWRT A-073-WIS(2), 14-34-0001-7106, 14-34-0001-8053.

Descriptors: *Fish control agents, *Piscicides, *Aquatic insects, *Invertebrates, *Toxicity, Water pollution effects, Wisconsin, Streams, Water pollution control, *Antimycin, Bioassay, *Ashippun River(Wisc).

The toxicity of antimycin to 38 species of Wisconsin stream insects was evaluated in static, aerated bioassays utilizing antimycin exposures typical of stream treatments used to kill fish. Several species of Trichoptera, Ephemeroptera and Plecoptera were very sensitive to fish killing concentrations of antimycin (EC-50 less than 50 ppb). Beetles (Psephenus herricki, Optioservus fastiditus, Stenelmis crenata, Helichus striatus, dragonfly nymphs (Neurocordulia molesta, Gomphurus vastus), damselfly nymphs (Argia apicalis), fishfly larvae (Nigronia serricornis), and snipe fly larvae (Atherix variegata) were relatively unaffected by antimycin (EC-50 greater than 1,000 ppb). Early instars of Tipula spp. and Ephemerella sp. were more sensitive to antimycin than later instars. Exposure to antimycin produced greater mortality at 19C than at lower temperatures in several species, even though exposure times were reduced at the higher temperature. Post-exposure observations indicated mortality may be delayed more than five days, particularly at reduced temperatures. Large differences in antimycin sensitivity were found for different species belonging to the same family (hydropsychid caddisflies, perlid stoneflies). Emergence of several species of stream insects was reduced or prevented by exposure of the mature larvae or nymphs to sublethal concentrations of antimycin. Pycnopsyche guttifer emerged successfully following exposure of the pupae to an antimycin concentration just below that which killed the larvae.
W79-00525

OXYGEN PRODUCTIVITY OF PERIPHYTON ON HIGHER AQUATIC PLANTS (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 2I.
W79-00529

SOME ASPECTS OF REDOX TRENDS IN THE BOTTOM MUDS OF A MESOTROPHIC BAYOU ESTUARY,
University of West Florida, Pensacola. Dept. of Biology.
G. A. Moshiri, and W. G. Crumpton.
Hydrobiologia, Vol. 57, No. 2, p 155-158, 1978. 2 fig, 7 ref. OWRT B-024-FLA(3), 14-31-0001-5065.

Descriptors: Sediments, Estuaries, *Oxidation-reduction potential, Mesotrophy, Muds, *Florida, Bayou Texas(Fla), Hydrogen ion concentration, Temperature, Salinity, Bacteria, Organic matter.

Redox profiles, pH, bacterial numbers, and organic content of sediments in Bayou, Texar, Pensacola, Florida, were examined in an effort to delineate spatial and temporal patterns. These data were accompanied by field determinations of dissolved oxygen, pH, temperature, and salinity. The results point to the importance of bacterial activity and bottom water dissolved oxygen upon the redox status of the sediments. It is suggested that, in certain systems, the redox status of deeper sediments may reveal long-term trends which are obscured at the sediment-water interface by transient effects. (Morgan-Florida)
W79-00533

MINERAL CYCLING IN SALT MARSH-ESTUARINE ECOSYSTEMS; ECOSYSTEM STRUCTURE, FUNCTION, AND GENERAL COMPARTMENTAL MODEL DESCRIBING MINERAL CYCLES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. Gunnison.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A052 737 as Price codes: A07 in paper copy, A01 in microfiche. Technical Report D-78-3, January 1978. 150 p, 24 tab, 3 fig, 260 ref, append.

Descriptors: *Heavy metals, *Salt marshes, *Estuarine environment, Ecosystems, *Cycling nutrients, *Dredged material, *Mineral cycling, Model studies.

A nutrient and heavy metal cycling study of marsh-estuarine ecosystems was undertaken for the Dredged Material Research Program. The objective was to gather as much information as possible on mineral cycling in marsh-estuarine ecosystems. A compartmental model outlining pathway of mineral cycling within the marsh-estuarine ecosystem was developed. Approaches used in the study included literature surveys and discussions with authorities in marsh-estuarine ecology. Information from allied fields of research was used to supplement direct sources of information. Chemical release of contaminants from dredged materials may cause problems. Oxygen demands exerted by reduced materials placed in aerobic waters can deplete oxygen. Several heavy metals have increased mobility once their binding sulfides have been oxidized. Oxidation of heavily contaminated marsh soils can cause metal toxicity for plants and cat clay formation. Eutrophication resulting from use of contaminated materials for marsh creation is not a problem, except in unproductive estuaries. Present knowledge is inadequate to permit accurate predictions of environmental impacts resulting from use of heavily contaminated materials in marsh creation. Only those dredged materials containing nutrients and heavy metals in quantities no greater than those in marsh soils at the creation site should be used for marsh development.
W79-00539

AN ASSESSMENT OF THE POTENTIAL IMPACT OF DREDGED MATERIAL DISPOSAL IN THE OPEN OCEAN,
Terco Corp., College Station, TX.
W. E. Pequegnat, D. D. Smith, R. M. Darnell, B. J. Presley, and R. O. Reid.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A053 183, Price codes: A99 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-2, January 1978. 645 p, 41 tab, 85 fig, 2 append.

Descriptors: *Oceans, *Environmental effects, Water pollution effects, *Dredged material disposal, *Ocean waste disposal.

Discusses factors which indicate deep ocean disposal of dredged material may need to be utilized more extensively in the future. Evaluates the potential physical, chemical, and biological impacts that may occur from dredged material disposal in the deep ocean at and beyond the outer edge of the continental shelves of the United States and its possessions. Selects and describes oceanic areas (not sites) off eleven sectors of U.S. coasts where officials may select disposal sites. Section A discusses Deep Ocean Disposal Perspectives, and Section B covers Deep Ocean Disposal Environmental Considerations. Parts of Section A are (1) basis and objectives of study with overall evaluation of the need for and impacts of deep ocean disposal of dredged material; (2) discussion of dredging-disposal process and nature of dredged material; and (3) designation of favorable and poor deep ocean areas for dredged material disposal, and criteria for selection. Section B is devoted to (1) discussion of the workings of marine ecological systems, (2) essential oceanographic conditions off coasts of all geographic sectors of the United States and its possessions, and (3) analysis of the fate and potential impact of dredged material disposed in the deep ocean. (WES)
W79-00549

ZOOPLANKTON STANDING CROPS IN THE DISCHARGE OF LAKE FRANCIS CASE, 1966-1972,
Fish and Wildlife Service, Yankton, SD.
D. B. Martin, and J. F. Novotny.
The American Midland Naturalist, Vol. 98, No. 2, October 1977, p 296-307. 4 fig, 4 tab, 7 ref.

Descriptors: *Zooplankton, *Lake Francis Case(SD), *Standing crops, *Reservoir releases, *Seasonal, *Reservoirs, Cyclops bicuspidatus thomasi, Diaptomus, Daphnia pulex, Daphnia galeata mendotae, Species composition, Faunal lists, Lakes, Missouri River, South Dakota, Nutrients, Organic matter.

Zooplankton standing crops in the discharge of Lake Francis Case, a Missouri River reservoir near Lake Andes, South Dakota, were monitored 1966-72 with an automatic plankton sampler. Standing crops of the three major taxa--Cyclops, Diaptomus, and Daphnia--fluctuated predictably, but causes of the fluctuations could not be determined. An important long-run decline in total zooplankton abundance was evident: during 1966-69 average total zooplankton standing crop ranged from 14.0-19.8/liter, while during 1970-72 average total standing crop varied from 5.7-8.7/liter. The reduction was due to a significant decline in Cyclops abundance, without an equivalent increase in Diaptomus or Daphnia abundance. Cyclops, the most abundant taxon during the study, had a strongly bimodal annual distribution with maxima in late spring and early winter. Diaptomus, next most abundant, was unimodal annually, with its maximum from early spring to midsummer. The annual cycle of Daphnia, the only other frequently encountered taxon, was weakly bimodal, with primary maximum in late spring and a secondary maximum in early winter. The decline in zooplankton standing crop does not appear to be caused by fish predation or water management practices. Zooplankton population may have been affected by a probable decline in export of nutrients, organic matter, and zooplankton from the new upstream reservoir, Lake Oahe, which reached operational level in 1969. (Lynch-Wisconsin)
W79-00551

DETRITUS IN THE LAKE ECOSYSTEM,
Connecticut Univ., Storrs. Biological Sciences Group.
P. H. Rich, and R. G. Wetzel.
The American Naturalist, Vol. 112, No. 983, January 1978, p 57-71. 5 fig, 1 tab, 53 ref. ERDA C00-1599-75 and NSF GB-6538, GB-28900X, GI-20.

Descriptors: *Detritus, *Lakes, *Ecosystems, *Carbon, *Energy transfer, Lake Lawrence(MI), Michigan, Ecology, Metabolism, Herbivores, Oxidation-reduction potential, Sediments, Trophic level, Food chains, Benthos, Respiration, Anaerobic conditions, Bacteria.

Present views of the role of detritus in lakes are inconsistent with the ecosystem concept, and underestimate the importance of carbon and energy pathways involving detritus. Nonpredatory losses from a plant-herbivore transfer, particularly in the form of dissolved organic matter and egestion, may be greater than the amount of material and energy transmitted up the grazer food chain. Ecosystem efficiencies are significantly higher than Lindeman (food chain) efficiencies. Benthic anaerobic metabolism (carbon dioxide production) is greater than benthic oxygen uptake estimates indicate; energy-rich intermediate products which undergo deferred respiration (O2 uptake) far from their origin may create oxidation-reduction gradients, drive chemosynthesis, and subsidize bacterial photosynthesis in the water column. Particulate and dissolved aquatic detrital material and its metabolism thus create a dynamic structure in lake sediments and water somewhat analogous to the trophic-dynamic aspect of the biota. Detrital-dynamic structure in lakes is not, however, simply an alternative mode of support for biota, but a major factor in entrainment of abiotic substances which subsidizes the biota. This reevaluation of the role of detritus resulted from a metabolism study in Lake Lawrence, Michigan. Topics covered include: (1) nonpredatory loss, (2) anaerobic respiration, (3) implications of benthic detrital electron flux, and (4) role of detritus. (Lynch-Wisconsin)
W79-00552

DEPENDENCE OF OXYGEN EVOLUTION AND UPTAKE BY CHLORELLA UPON THE NATURE OF LIGHT FIELD DISTRIBUTION IN THE SUSPENSION,
Akademiya Nauk SSSR, Pushchino. Inst. of Biological Physics.
A. B. Brandt, M. I. Kiseleva, and G. Z. Finakov.
Soviet Plant Physiology, Vol. 23, No. 4, July 1976, p 596-600. Translated from Fiziologiya Rastenii, Vol. 23, No. 4, July-August 1976, p 710-714. 3 fig, 2 tab, 26 ref.

Descriptors: *Chlorella pyrenoidosa, *Light, *Oxygen, *Photosynthesis, *Suspension, *Polarographic analysis, Absorption, Algae, Cultures, Respiration, Density, Gas exchange, Metabolism, Energy.

Polarography was used to investigate rates of oxygen evolution (photosynthesis) and uptake (respiration) as a function of density of a Chlorella pyrenoidosa suspension, and distribution of the light field in the polarographic cell. Results indicate a promising outlook for the proposed polarographic method and cell design in studying gas exchange of unicellular autotrophic algae. At wholly equal absorption of impinging radiation by the Chlorella suspension, the specific energetic photosynthetic activity of cells in the suspension was practically the same. Specific photosynthetic activity of the cells increased significantly with decrease of suspension density and assurance of sufficient illumination of cells in all layers of the polarographic cell. Even such a high PAR irradiance as 622 W/sq m is therefore not photosynthesis-saturating in Chlorella. The respiration rate of Chlorella cells depended upon conditions of their preliminary illumination. Cell respiration activity increased with light and with increases in the specific efficiency of photosynthesis; this relationship is attributable not only to direct light stimulation of metabolic processes, but also to greater accumulation of primary photosynthetic products at high specific photosynthesis with good illumination, leading to greater energy expenditure for secondary conversions. The polarographic cell consisted of a plexiglas chamber with a volume of 20 cu cm. (Lynch-Wisconsin)
W79-00553

FOOD SIZE SELECTION AND SEASONAL SUCCESSION OF FILTER FEEDING ZOOPLANKTON IN AN EUTROPHIC LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
Z. M. Gliwicz.
Ekologia Polska, Vol. 25, No. 2, 1977, p 179-225. 12 fig, 3 tab, 83 ref.

Descriptors: *Zooplankton, *Filter feeders, *Eutrophication, *Mikolajskie Lake(Poland), *Succession, *Food habits, *Seasonal, Particle size, Size, Lakes, Poland, Crustaceans, Algae,

Filamentous algae, Limiting factors, Grazing, Phytoplankton, Daphnia cucullata, Daphnia longispina, Bosmina coregoni, Eudiaptomus graciloides, Diaphanosoma brachyurum, Chydorus sphaericus, Net phytoplankton.

Data on seasonal changes in zooplankton and phytoplankton in eutrophic Mikolajskie Lake, Poland, were used to assess effects of small (edible) and large (inedible) algae on succession of plankton crustaceans, and upon the demography of planktonic filter feeders. Results showed that filtering rate, feeding rate, fecundity, and abundance of some species (group 1 below) are more strongly limited by available food concentration, while in other species (group 2) these characteristics are limited by high concentrations of large, filamentous algae. The former group are distinguished by a smaller upper size limit of particles grazed (and a narrower gap between carapace margins in cladocerans), and the latter by a greater upper size limitk and therefore by greater susceptibility to filtration interference by net phytoplankton. In Mikolajskie Lake the following seasonal succession of the two groups occurs: (1) spring increase of group 1--Daphnia cucullata, D. longispina, Bosmina coregoni, and Eudiaptomus graciloides, peaking in June; (2) summer decline of this population, coinciding with an increase in group 2--Diaphanosoma brachyurum and Chydorus sphaerieus; and (3) autumn return of the first population with decline of the second. Net phytoplankton concentration seems to have a greater limiting influence on competitively stronger species, permitting the appearance and persistence of competitively weaker species. (Lynch-Wisconsin)
W79-00554

ZONATION OF MARINE GASTROPODS ON A ROCKY INTERTIDAL SHORE IN THE ADMIRALTY GULF, WESTERN AUSTRALIA, WITH EMPHASIS ON THE GENUS NERITA,
Western Australian Museum, Perth.
F. E. Wells.
The Veliger, Vol. 20, No. 3, January 1977, p 279-287. 3 fig, 2 tab, 18 ref.

Descriptors: *Nerita reticulata, *Gastropods, *Shores, *Admiralty Gulf(Australia), *Zonation, *Species diversity, Species composition, Walsh Point(Australia), Australia, Snails, Nerita undata, Nerita polita, Mollusks, Habitats, Tidal effects, Gulfs, Littoral, Rocks.

Zonation of marine gastropods on the rocky intertidal shore of Walsh Point, Admiralty Gulf, western Australia, studied in fall 1976, showed highest diversity in middle areas, tapering off toward both higher and lower portions of the shore. Although it would be expected that diversity would be highest in the lower intertidal area covered by seawater for the longest periods, the beach structure at Walsh Point provides an explanation. Rocks of the mid-tide region are large and close together, thus providing abundant and stable crevices for snails to retreat into during low tide; in the lower portion of the zone rocks are spaced about 30 cm apart, precluding such refuges. A total of 3375 individuals belonging to 18 gastropod species were collected for this study, although a broader survey of mollusks in the gulf indicates at least 75 species of gastropods occur at Walsh Point. Two species of Nerita were overwhelmingly dominant, with N. reticulata accounting for 38.9% of all specimens and N. undata 32.3%; a third species, N. polita, accounted for 1.8%. N. polita was mostly located away from the other two, being an upper intertidal species. The index of overlap between N. polita and N. reticulata was only 0.07, while between N. polita and N. undata, which occupies the intermediate position on the shore, the overlap was much higher, 0.29. Overlap between N. undata and N. reticulata was substantial, although there was some segregation. (Lynch-Wisconsin)
W79-00555

AN APPROACH TO QUANTITATIVE NUTRITION OF PHYTOPLANKTON,
Scottish Marine Biological Association, Oban.
M. R. Droop.
The Journal of Protozoology, Vol. 24, No. 4, November 1977, p 528-532. 2 fig, 1 tab, 25 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Nutrients, *Plant growth, *Substrates, Algae, Model studies, Vitamins, Ecology, Biomass, Monod model, Limiting factors.

A two-compartment model of phytoplankton growth in relation to nutrients is able simultaneously to handle multiple nutrients and organisms in an environment of changing inputs and outputs. The simple one-compartment Monod model for substrate-limited growth is discussed, which requires cells to be in equilibrium with their surroundings. But including conservative substrates--those not required--complicates the analysis. Chemical composition of cells is sensitive to environmental conditions, including the specific growth rate itself. Since the compounds under investigation were never the controlling substrate, there is nothing to suggest they might still vary with growth rate had they been in control. In 1968 the correlative suggestion was made that growth rate was related to internal substrate level rather than vice-versa. Subsequent work unequivocally demonstrated the interdependence of specific growth rate and internal concentrations of these limiting nutrients. Growth rate was apparently controlled by the level of the internal pool. The two-compartment model represents a modification of the Monod model to incorporate these developments. An example of the model's performance in a batch culture is given. It is noted that for such models to be of real value to ecologists the community as a whole must be modelled. (Lynch-Wisconsin)
W79-00556

BIOLOGICAL INTERACTIONS AND THE REALIZED NICHE OF EUPLOTES VANNUS FROM THE SALT MARSH AUFWUCHS,
New York Inst. of Tech., Old Westbury. Dept. of Life Sciences.
W. A. Muller, and J. J. Lee.
The Journal of Protozoology, Vol. 24, No. 4, November 1977, p 523-527. 5 fig, 1 tab, 34 ref.

Descriptors: *Euplotes vannus, *Niches, *Allogromia laticollaris, *Chromadorina germanica, *Ecology, *Competition, Salt marshes, New York, Littoral, Ecosystems, Ciliates, Biological communities, Herbivores, Food habits, Limiting factors, Nutrients, Hydrogen ion concentration, Protozoa, Periphyton, Eutrophication, Algae.

Biological interactions of the hypotrich ciliate protozoan Euplotes vannus with two other herbivores, the foraminiferan Allogromia laticollaris, and the nematode Chromadorina germanica were studied in nutrient limiting and nutrient non-limiting situations. E. vannus is a member of diverse communities of microorganisms, small algae, and small animals, functionally interwoven in time and space, which help transform macrophyte structural materials into compounds usuable by larger carnivorous and omnivorous animals. E. vannus, which grows well over broad ranges of temperature and salinity, requires higher densities of food (>10,000 cells/ml) for rapid reproduction than do A. laticollaris (>100 cells/ml) and C. germanica (1000 cells/ml or less). With initially high food levels (about one million cells/ml) the ciliates reproduced rapidly and consumed algae faster than it could reproduce. Some balance between algae and ciliates was achieved at initial algal concentrations of about 100,000 cells/ml. With equal numbers of the three species studied in microcosm experiments at 25C, E. vannus competed very poorly, reaching only 20% of control levels when grown with C. germanica and 13% when cultured with A. laticollaris. It competed better in two-species microcosms when temperatures were lower and when its ratio to the other species was initially higher. Organisms were originally isolated from North Sea Harbor, Long Island, New York. (Lynch-Wisconsin)
W79-00557

LIMNOLOGICAL STUDY OF THE CHICA DE SAN PEDRO, LA POSADA AND LO MENDEZ LAGOONS: I. QUANTITATIVE AND QUALITATIVE ANALYSIS OF WINTER PLANKTON (IN SPANISH),
Concepcion Univ. (Chile). Dept. of Botany.
O. O. Parra, V. Dellarossa, and E. Ugarte.
Bol Soc Biol Concepcion 50, p 73-86, 1976.

Descriptors: *Phytoplankton, *Zooplankton, *Lagoons, Analysis, Bioassay, Distribution, *Chile, Eutrophication, Water pollution.

A qualitative and quantitative analysis of winter phytoplankton and zooplankton from 3 Chilean lagoons, Concepcion, Chile were carried out. A comparative study of the different planktonic groups identified the dominant species for each lagoon. Tables of monthly distribution and abundance values of the species are included.--Copyright 1978, Biological Abstracts, Inc.
W79-00558

ENZYMATIC RELEASE OF PHOSPHATE IN WATER FROM SUBARCTIC LAKES IN NORTHERN SWEDEN,
Uppsala Univ. (Sweden). Inst. of Limnology.
M. Jannson.
Hydrobiologia, Vol. 56, No. 2, p 175-180. 3 fig, 1 tab, 18 ref.

Descriptors: *Enzymes, *Phosphates, *Phosphatases, *Seston, *Particulates, *Plankton, *Degradation(Decomposition), Sweden, Lakes, Subarctic, Nutrients, Tracers, Phosphorus, Hydrolysis, Lake Stugsjon(Sweden), Lake Hymenjaure(Sweden), Lake Magnusjaure(Sweden), Filtration, Eutrophication, Chromatography.

In a study of phosphatase activity and phosphate regeneration in three small subarctic lakes in northern Sweden, considerable amounts of phosphate from autoclaved water were released by phosphatases. Particulate matter was also demonstrated to be an important source of phosphorus to planktonic organisms, and a possible substrate for phosphate-releasing enzymes. Exposure of autoclaved 32phosphorus-labelled plankton to lake enzymes, followed by characterization of degradation products with gel chromatography, showed that phosphate was enzymatically released from particulate matter. That seston is a vitally important phosphorus source for plankton was indicated by high phosphatase activity resulting from inoculation of seston-free lake water with plankton. Three experiments were conducted during this study: (1) addition to unfiltered autoclaved lake water of a concentrate of lake enzymes prepared by ultrafiltration; (2) inoculation of plankton into different filtrates of lake water; and (3) addition of an enzyme concentrate to autoclaved 32phosphorus-labelled seston in autoclaved nonradioactive lake water. The lakes studied were Lake Stugsjon, Lake Hymenjaure, and Lake Magnusjaure. Lake Stugsjon is oligotrophic, with a total phosphorus concentration of about seven micrograms/liter and total nitrogen of about 200 micrograms/liter. The other two lakes are changing from oligotrophy to increasing eutrophication due to artificial phosphorus and nitrogen enrichment. (Lynch-Wisconsin)
W79-00559

THE OCCURRENCE OF INTERNAL PHOSPHORUS LOADING IN TWO SMALL,

EUTROPHIC GLACIAL LAKES IN NORTHEASTERN OHIO,
Kent State Univ., OH. Dept. of Biological Sciences.
G. D. Cooke, M. R. McComas, D. W. Waller, and R. H. Kennedy.
Hydrobiologia, Vol. 56, No. 2, 1977, p 129-135. 2 fig, 2 tab, 23 ref. EPA R-80193605.

Descriptors: *Eutrophication, *Twin Lakes(OH), *Nutrient budget, *Phosphorus, *Internal loading, *Water pollution sources, Lake restoration, Water pollution control, Ohio, Lakes, Glacial lakes, Nutrients, Sediments, Macrophytes, Sediment-water interfaces.

Nutrient budgets for the small, eutrophic Twin Lakes of northeastern Ohio during the summers of 1972-74 indicate that 65-100% of the summer increase in phosphorus content in the water is due to internal loading. Internal loading appears to delay recovery of each lakes following nutrient diversion, and chemical inactivation of phosphorus with aluminum hydroxide may be necessary. Water samples were collected in East and West Twin Lakes and in three inflowing streams, and analyzed for total phosphate-phosphorus; water temperature was also monitored. Possible loading sources: (1) Phosphorus release from anoxic sediments, (2) seston sedimentation, (3) groundwater income, (4) wind stress causing transfer of nutrient-rich hypolimnetic water to the epilimnion, (5) macrophyte transport of phosphorus from sediment to water, and (6) epiphyte excretion. Results of this study conflict with previous studies of the experimental Canadian Shield lakes, possibly due to the latter not having large nutrient reservoirs in the sediments as are found in naturally eutrophic lakes. The Twin Lakes are kettle-type lakes receiving upland drainage, urban runoff, and, until 1972, septic tank discharge; there is no agricultural drainage. The lakes thermally stratify by mid- to late April and remain stratified until mid-November. Macrophyte growth is extensive, covering 25% of the lake area. (Lynch-Wisconsin)
W79-00560

STRUCTURAL CHARACTERISTICS OF A DIATOM COMMUNITY EPIPHYTIC ON RUPPIA MARITIMA,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
M. J. Sullivan.
Hydrobiologia, Vol. 53, No. 1, 1977, p 81-86. 1 fig, 5 tab, 11 ref.

Descriptors: *Ruppia maritima, *Diatoms, *Epiphytes, *Great Bay salt marsh(NJ), *Species diversity, *Biological communities, Algae, Salt marshes, New Jersey, Navicula pavillardi, Spartina alterniflora, Widgeon grass, Marsh plants, Floral lists, Diversity indices, Shannon-Wiener index, Similarity, Analytical techniques.

A study of structural characteristics of the epiphytic diatom community on widgeon grass (Ruppia maritima) in New Jersey's Great Bay salt marsh (May-September 1975) showed high community diversity during initial R. maritima growth, followed by sustained low levels after host vegetative growth had ceased and no new attachment sites were available. Although 57 diatom taxa were identified, Navicula pavillardi, the dominant taxon, accounted for one-third of all individuals collected. Leaves and internodes of R. maritima support a single, nearly homogeneous epiphytic diatom community; differences between leaves and internodes are minimal, according to analysis of variance and to Stander's similarity index. Marsh sediments are the major source of individuals for Ruppia colonization, as indicated by comparing the epiphytic diatom community with diatoms inhabiting the marsh proper. The salt marsh is dominated by dwarf Spartina alterniflora; two pools known to support luxuriant Ruppia growth were sampled monthly for the study. After taxonomic analysis, species diversity (H') was calculated using the Shannon-Wiener informational index. Species diversity, number of diatom taxa in a given sample, and relative abundance of 12 abundant taxa were subjected to two-way analysis of variance (date x site). (Lynch-Wisconsin)
W79-00561

NUTRIENT LIMITATION OF PHYTOPLANKTON IN A CENTRAL ARIZONA RESERVOIR,
Arizona State Univ., Dept. of Botany and Microbiology.
N. L. Crane, and M. R. Sommerfeld.
Hydrobiologia, Vol. 51, No. 3, 1976, p 219-224. 4 fig, 2 tab, 29 ref.

Descriptors: *Limiting factors, *Phytoplankton, *Lynx Lake(AZ), *Nitrogen, *Phosphorus, *Carbon, Nutrients, Arizona, Reservoirs, Lakes, Algae, Chlorophyll, Hydrogen ion concentration, Dissolved oxygen, Species composition, Chlorella, Scenedesmus, Cosmarium, Standing crops, Biomass.

Additions of nutrients (nitrogen, phosphorus, and carbon) individually and in combinations to eight polyethylene bags partially submerged in Lynx Lake, near Prescott, Arizona, a reservoir characterized by low nitrogen and phosphorus levels and a sparse, nondiverse phytoplankton population, showed that only nitrogen and phosphorus together limited the phytoplankton. Large increases in phytoplankton numbers, extractable chlorophyll, pH, and dissolved oxygen occurred only in bags to which either nitrogen-phosphorus, or nitrogen-phosphorus-carbon were added, but not in bags with nutrients added individually or in other combinations. Maximum populations were obtained on the tenth day after nutrient addition, and were two to three times that of the control. Little alteration in species composition was observed. Chlorella sp. dominated, with Scenedesmus sp. and Cosmarium sp. also prevalent. The diatoms Epithemia sorex, Rhodopalia gibba, Synedra tabulata, and Synedra ulna were present in small numbers. Nutrient concentrations are low throughout the year in the lake, with less than 0.01 mg/liter orthophosphate-phosphorus and 0.02 mg/liter nitrate-nitrogen. The polyethylene bags, 43 cm in diameter and 1.0 m in length, were submerged to within 15 cm of the top, and kept afloat by wooden frames. Nutrients were added as solutions of the salts NaHCO3, NaNO3, and Na2HPO4. (Lynch-Wisconsin)
W79-00562

AMMONIA-NITROGEN EXCRETION IN DAPHNIA PULEX,
North Dakota State Univ., Fargo. Dept. of Zoology.
T. R. Jacobsen, and G. W. Comita.
Hydrobiologia, Vol. 51, No. 3, 1976, p 195-200. 4 fig, 14 ref.

Descriptors: *Daphnia pulex, *Ammonia, *Nitrogen, *Excretion, *Water temperature, *Weight, Eutrophication, Phytoplankton, Algae, Silver Lake(MN), Minnesota, Lakes, Chlamydomonas reinhardi, Zooplankton, Energy budget, Proteins, Amino acids.

Ammonia-nitrogen excretion rates of the zooplankter Daphnia pulex in natural summer and cultured populations (from Silver Lake, Clay County, Minnesota) appear partially dependent on temperature and dry body weight, but are probably also affected by food concentration and physiological/environmental influences. An inverse relationship between ammonia-nitrogen excretion and phytoplankton blooms is likely. Ammonia-nitrogen excretion dropped from 0.26-28 micrograms N/animal/day before and after the first bloom in late June (1973) to 0.1 micrograms during the second and third blooms in late July and late September, then increased to 0.145 micrograms. Temperature during the three blooms was 20, 25, and 15C. indicating ammonia-nitrogen excretion may be more dependent on factors other than temperature. One explanation for the excretion rate decrease during blooms may be utilization of proteins and amino acids as secondary energy sources. The mean ammonia-nitrogen excretion rate for the summer population was 0.2 micrograms N/animal/day, or 5.11 micrograms N/mg dry body wt/day (N=80) measured at 15, 20, and 25C. Excretion rates of D. pulex cultured on Chlamydomonas reinhardi yielded the temperature relationship Log10E=(0.061) T 1.773, where E is micrograms N/animal/day and T is temperature. Excretion on a mg dry body wt/day basis was related to temperature as Log10E=(0.043) T + 0.153, where E is micrograms N/mg dry body wt/day. (Lynch-Wisconsin)
W79-00563

SPECIES DENSITIES OF MACROBENTHOS ASSOCIATED WITH SEAGRASS: A FIELD EXPERIMENTAL STUDY OF PREDATION,
Smithsonian Institution, Fort Pierce, FL.
D. K. Young, M. A. Buzas, and M. W. Young.
Journal of Marine Research, Vol. 34, No. 4, 1976, p 577-592. 2 fig, 6 tab, 44 ref, 1 append.

Descriptors: *Density, *Seagrass, *Predation, *Benthic fauna, *Invertebrates, *Indian River estuary(FL), *Food webs, Ecosystems, Fish, Crustaceans, Decapods, Halodule wrightii, Florida, Estuaries, Rivers, Faunal lists, Carnivores, Deposit feeders, Cages, Food habits, Macrofauna.

Predator exclusion cages were monitored October 1974-Febrary 1975 at three sites in the Indian River estuary, east-central Florida, to determine the effects of the cages on benthic invertebrates larger than one mm associated with the seagrass Halodule (=Diplathera) wrightii. At two sites (Haulover Canal and Link Port) the expected increase in species density occurred, while at the third, St. Lucie, Species density decreased, due probably to predation from carnivorous decapod crustaceans found in larger numbers at this site. The decapods were protected from fish predation by the cage. Multivariate analysis of variance with interaction, used to assess densities of 33 numerically dominant macrofaunal species at the three sites, demonstrated previously unrecognized differences in caging effects. The overall time hypothesis of the model was significant at all sites, but the time of experiment initiation may determine effects of a particular cage, as evidenced by the fact that the same species did not attain maximum densities simultaneously. Thirty-two of the dominant species were grouped as r-strategists (or opportunists, whose densities were strongly regulated by predation as well as by undetermined chance events. Because of their food web interrelationships, decapod predation probably increases the efficiency of fish consumption of seagrass-associated mcrofauna. Dominant species included 17 deposit feeders, seven suspension feeders, six carnivores, and three herbivores-scavengers. (Lynch-Wisconsin)
W79-00564

TRANSPORT LIMITED NUTRIENT UPTAKE RATES IN DITYLUM BRIGHTWELLII,
Johns Hopkins Univ., Baltimore, MD. Dept. of Geography and Environmental Engineering.
W. J. Pasciak, and J. Gavis.
Limnology and Oceanography, Vol.20, No. 4, July 1975, p 604-617. 6 fig, 5 tab, 11 ref. NSF GA-36282.

Descriptors: *Ditylum brightwellii, *Nutrients, *Absorption, *Limiting factors, *Transport, *Phytoplankton, *Plant growth, Algae, Diffusion, Nitrates, Nitrites, Shear, Shape, Equations, Michaelis-menten relationships.

Transport limitation of nutrient rate, demonstrated experimentally for the marine unicellular diatom Ditylum brightwellii, can be presumed to occur for other species. This factor may be important for

studying phytoplankton growth under natural conditions. The present study extends to cylindrical and disk-shaped cells an earlier analysis of diffusional transport limitation of nutrient uptake rates applied to spherical cells. Data show that transport limitation of nitrate and nitrite uptake rates by the phytoplankter occurred at low concentrations in still media, and that when the organism was placed in a sufficiently high shear field, transport limitation was overcome; transport limitation also disappeared at high nutrient concentration, and limitation effect was decreased by mixing. D. brightwellii was chosen for the experiments because it could show transport-limited uptake at low nutrient concentrations, is easily cultured, and because its nitrate and nitrite uptake rates have been extensively studies. Culture medium was half seawater and half 2.5% sodium chloride solution, supplemented by trace metals and vitamins, and all tests were conducted at 18-20 C. In most experiments nitrate was the limiting nutrient. In the shear field experiments, conducted in special apparatus (described), the rate of shear was kept temporally and spatially constant. Uptake rates could be directly compared for still ad moving cells. (Lynch Wisconsin)
W79-00565

LIGHT RESPONSES OF DAPHNIA PULEX,
Wisconsin Univ.-Madison. Lab. of Limnology.
S. C. Stearns.
Limnology and Oceanography, Vol. 20, No. 4, July 1975, p 564-570. 3 fig, 3 tab, 19 ref.

Descriptors: *Daphnia pulex, *Light, *Color, *Wavelengths, *Diel migration, *Food habits, Biorhythms, Zooplankton, Cladocera, Grazing, Phytoplankton, Algae, Diurnal.

The cladoceran Daphnia pulex was tested for activity responses to different wavelengths of light at constant intensity, and in white light at fixed intensity. Purposes were to (1) check Smith and Baylor's conclusions that daphnids respond to color changes, (2) assess reliability of ambient light color as a guide for zooplankton grazers in locating food (algae) as postulated by Smith and Baylor, and (3) learn if daphnids have a circadian response to light intensity that could bias results at different times of the day. Smith and Baylor observed that at wavelengths of incident light below 500 nm D. magna tended to roam horizontally, while at wavelengths above 600 nm they tended to stay in place through a vertical hop-and-sink motion; they proposed that such behavior would either maintain the daphnids under algae where the light may be reddish, or in clear water dominated by blue-green wavelengths impel them to seek out algae. Results of te current testing showed that: (1) Daphnids tend to move vertically between 480 (blue ad 735 (red) nm, and horizontally at 440 nm (violet) and in white light, thus corroborating Smith and Baylor's observations. (2) The color of ambient light is probably not a reliable indicator for 300 plankton in finding phytoplankton. (3) D. pulex exhibit a circadian activity rhythm, with total activity low at night, increasing to a peak in the morning, and declining through the afternoon. (Lynch-Wisconsin)
W79-00566

SESTON DYNAMICS AND TRIPTON SEDIMENTATION IN THE PELAGIC ZONE OF A SHALLOW EUTROPHIC LAKE,
Wisconsin Univ.-Madison. Lab. of Limnology.
A. Gasith.
Hydrobiologia, Vol. 51, No. 3, 1976, p 225-231. 3 fig, 2 tab, 21 ref. NSF AG-199 BMS 69-01147 A 09.

Descriptors: *Seston, *Tripton, *Sedimentation, *Organic matter, *Lake Wingra(WI), *Eutrophication, Pelagic zone, Lakes, Sediments, Phytoplankton, Zooplankton, Macrophytes, Productivity, Carbon, Wisconsin, Shallow water, Particulates, Benthic flora, Detritus, Suspended solids, Insects.

Transport of organic matter from water column to sediments in shallow eutrophic Lake Wingra (Madison, Wisconsin) was investigated, as well as the relationship between dynamics of total suspended matter (seston) and the settleable fraction (organic detritus, or tripton). Corrections were made to eliminate resuspended bottom sediments (and living components) from tripton measurements. Results show that sedimentation of tripton is closely related to seston dynamics, with a lag of two to four weeks. Tripton sedimentation rate ranged from 0 g/sq m/day in May to eight g in August. Relative to seston standing crop, maximum sedimetation rate was 8% seston/day (in September). Annual tripton sedimentation is estimated at 632 g dry wt (215 C/sq m), equivalent to 55% of annual phytoplankton production ad 42% of combined annual phytoplankton and macrophyte production. An estimated 70% of settling organic matter is decomposed annually, indicating that only a small fraction of tripton is represented in the long-term accumulation of bottom deposits. Possible factors influencing tripton sedimentation include: (1) water turbulence, (2) differences in phytoplankton associations, and (3) phytoplakton-zooplankton interactions. High orgaic content of seston and significant correlation between phytoplankton productivity and seston concentration suggest that the pelagic seston in Lake Wingra is primarily of planktonic origin. (Lynch Wisconsin)
W79-00567

A QUANTITATIVE STUDY OF THE PHYTOPLANKTON OF THE RIVER AVON, BRISTOL,
Ankara Univ. (Turkey). Dept. of Systematic Botany.
G. Aykulu.
British Phycological Journal, Vol. 13, No. 1, March 1978, p 91-102. 3 fig, 1 tab, 6 ref.

Descriptors: *Phytoplankton, *Avon River(England), *Seasonal, *Rivers, *Species composition, Benthic flora, Benthos, England, Diatoms, Centric diatoms, Chlorophyceae, Cryptophyceae, Nutrients, Biomass, Succession, Algae, Cryptomonas.

Quatitative study (June 1972-August 1973) of the phytoplankton of the River Avon, England, shows dominance by centric diatoms, with Chlorophyceae richest in number of species, and the cryptophyte cryptomonas sp. of ten abundant. Centric diatoms increase in spring and autumn, and chlorophyceae are abundant in summer. Total phytoplankton increases downstream. Phytoplankton numbes are generally high in midspring and summer, decrease gradually toward the end of autumn, and are low in winter. Nutrients apparently do not limit algal growth in the river. Phytoplankton of the River Avon are very similar in species cmposition to those of the rivers Lee, Stour, Kennet, Thames, and Severn; this suggests a common planktonic flora dominated by small centric diatoms (Stephanodiscus, Cyclotella, and Thalassiosira), with a fairly regular occurrence of the pennate Nitzschia acicularis, and subsidiary roles for flagellate and cooccoid Chlorophyta. Although species are fewer in number and less varied in the rivers than in lakes, there are similarities with eutrophic lake plankton. True river plankton definitely exist, and are not merely derived from the benthos; they are instead species which only reproduce rapidly when suspended in the water, but are able to maintain themselves while sedimented and entangled in the debris of the benthos. (Lynch Wisconsin)
W79-00568

TRANSLOCATION OF PHOTOASSIMILATED 14C IN THE RED ALGA POLYSIPHONIA LANOSA,
Leeds Univ. (England). Dept. of Plant Sciences.
C. H. C. Turner, and L. V. Evans.
British Phycological Journal, Vol. 13, No. 1, March 1978, p 51-55. 1 fig, 1 tab, 6 ref.

Descriptors: *Polysiphonia lanosa, *Carbon radioisotopes, *Rhodophyta, *Photoassimilates, *Ascophyllum nodosum, *Translocation, *Plant physiology, *Reproduction, Epiphytes, Algae, Photosynthesis, Darkness, Procarps, Carbospores, Metabolites, Metabolism, Respiration, Spores.

Procarps (the female organ of red seaweed) of the epiphytic red alga Polysiphnia lanosa continued to accumulate carbon-14 in the dark and in the absence of external radioactivity, following photosynthetic carbon-14 assimilation. Accumulation is shown to be derived from photoassimilates originating in the gametophytic tissue supporting the procarp. Results thus establish that translocation of photoassimilates occurs within p. lanosa, and that an effective distribution of any metabolites derived from its host plant, Ascophylum nodosum, could occur withing the epiphyte. The ultimate goal of this research is to determine if directional translocation of assimilate occurs between ascopyllum nosdusum and its epiphyte P. lanosa. Sporulating tissue was used in the experimets, where significant assimilate movement might be expected. Sterily P. lanosa plants and female plants bearing a procarps were collected at Culler-coats in northeast England in September. Although movement of metabolites through intct pit connections is unlikely, and no other from of intercellular connection has been found, substances must move between red algal cells. During such periods as cystocarp development, pit connections break down and disappear, undoubtedly assisting in bulk translocation of photoassimilates which apparently occurs at that time. Rhodophyte growth and development may therefore be controlled to some degree by seasonal and perhaps selective breakdown of pit connections. (Lynch-Wisconsin)
W79-00569

CHANGES IN CARBON AND NITROGEN CONTENT DURING DECOMPOSITION OF THREE MACROPHYTES IN FRESHWATER AND MARINE ENVIRONMENTS,
Oakland Univ., Rochester, MI. Dept. of Biological Sciences.
R. D. Hunter.
Hydrobiologia, Vol. 51, No. 2, 1976, p 119-128. 4 fig, 2 tab, 31 ref.

Descriptors: *Carbon, *Nitrogen, *Degradation(Decomposition), *Chara contraria, *Lemna minor, *Fucus vesiculosus, Macrophytes, Ash, Salt marshes, Shores, Ponds, Swamps, Aquatic plants, Detritus, Food chains, Duckweed, Organic matter.

In an effor to study in-situ changes in quantity and quality of dead plant material in small lentic freshwater and rocky shore marine environments, ash, organic carbon, and total nitrogen content were determined for the aquatic macrophytes Chara contraria, Lemna minor, and Fucus vesiculosus, both fresh and after decomposition, in both kinds of habitat. Chara was studied in a small freshwater pond and Lemna in a shallow swamp over 70 days of in-situ decomposition, and Fucus was examined over a 63-day period in a rocky shore area and in a salt marsh. Chara showed a progressive decrease in carbon and an increase in nitrogen, while Lemna increased in carbon and decreased in nitrogen (ash-free dry weight). Although the Chara carbon:nitrogen ratio was initially high and that of Lemna relatively low, C:N after decomposition was nearly the same for both. In the salt marsh, Fucus decomposition produced no significant change in carbon, but an increase in nitrogen. On the rocky shore, decompostion decreased carbon and increased nitrogen. Much of the initial total dry weight loss during submergence is attributable to solubilization of ash and of some high C:N ratio organic material. Accumulation of a high proportion of autotrophic microbial biomass (such as purple sulfur bacteria) in the structural carbohydrates of the salt marsh Fucus may have caused observed

differences in C:N of the decomposing Fucus. Data suggest that initial differences in nutritional value of aquatic macrophytes diminish during decompostion, and the ultimate C:N may be more dependent on decomposer organisms than on type of organic material. (Lunch Wisconsin)
W79-00571

EFFECT OF THE CONCENTRATION OF NITROGEN COMPOUNDS ON MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznan (Poland). Inst. of Chemistry.
F. Domka, and J. Sasiorek.
Acta Microbiolgica Polonica, Vol. 7, No. 4, 1975, p 259-262. 3 fig, 1 tab, 6 ref.

Descriptors: *Sulfates, *Reduction(Chemical), *Desulfovibrio desulphuricans, *Microorganisms, *Nitrogen, *Sulfur, Nitrogen-sulfur ratio, Sulfides, Carbon.

In tests of microbial sulfate reduction by Desulfovibrio desulphuricans, a change in the nitrogen:sulfur ratio in the reaction medium affected the degree of reduction of sulfates to sulfides. In previous investigations of such reduction by the present authors, effects of temperature, pH and carbon:sulfur ratio had been studies. Optimal reduction conditions were at an N:S ratio of 0.33. The time interval between the initial and log phase of the process was also dependent on the N:S ratio. Five media closely resembling Starkey's medium with varying N:S ratios (mg/20 ml) of 0.19, 0.33, 0.48, 0.63, and 1.22 were used in the experiments. All experiments were conducted at 33 C in Polezajev bottles; pH was maintained at 6.8. The carbon:sulfur ratio was held constant at 1.84, determined in a previous study to be optimal. Results indicate that for microbial reduction of sulfates to sulfides on an industrial scale, an adequate supply of utilizable nitrogen is required to assure optimal reduction conditions. (Lynch-Wisconsin)
W79-00572

DEGRADATION OF UREA BY BACTERIA AND ALGAE IN MASS ALGAL CULTURES,
Warsaw Univ. (Poland), Dept. of Environmental Microbiology.
For primary bibliographic entry see Field 5D.
W79-00573

A MODEL OF RENEWABLE RESOURCES AND LIMITATION OF DEPOSIT-FEEDING BENTHIC POPULATIONS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
J. S. Levinton, and G. R. Lopez.
Oecologia, Vol. 31, No. 2, 1977, p 177-190. 6 fig, 1 tab, 32 ref.

Descriptors: *Hydrobia minuta, *Mathematical models, *Deposit feeders, *Limiting factors, *Renewable resources, *Fecal pellets, *Benthic fauna, Hydrobia ventrosa, Snails, Gastropods, Equilibrium, Model studies, Coprophagy, Food habits, Mud snails, Flax Pond(NY), New York, Denmark, Ponds, Lagoons, Sedimentation, Sediments, Carrying capacity.

A model is developed for resource renewal, geared to the deposit of feeding mud snails, Hydrobia minuta and H. ventrosa; additionally, a logistic model of recovery is proposed for living resources that are themselves limited by nutrients or space. The models are used to predict carrying capacities of Hydrobia; the renewal rate of resources exploited by a population influences carrying capacity and competitive interaction. Benthic animals such as Hydrobia which feed on deposits ingest sedimentary particles and organic debris, assimilate attendant microorganisms, and egest fecal pellets. Following egestion, the fecal pellets are recolonized by microorganisms, and again become a food source for deposit feeders. H. ventrosa would not ingest fecal pellets until they had broken down into component particles and debris, apparently an adaptive mechanism to ensure that ingested material has had sufficient time to be recolonized. Pellet breakdown rate is thus concluded to be an important limiting factor, and pellet breakdown is regarded as the renewable resource. Population densities predicted by the pellet breakdown model were in the general range of those measured for Hydrobia populations in the field. Hydrobia minuta specimens were collected from Flax Pond, New York, and specimens were collected from Flax Pond, New York, and specimens of H. ventrosa from a pond and lagoon in Denmark. In the resource renewal model, resource is always available if the fraction exploited per day is less than one minus the fraction remaining per day. (Lynch-Wisconsin)
W79-00575

ACID LAKE RENOVATION,
Peabody Coal Co., Central City, KY. Regional Lab.
For primary bibliographic entry see Field 5G.
W79-00576

LIMNOLOGICAL STUDY OF THE CHICA DE SAN PEDRO, LA POSADA AND LO MENDEZ LAGOONS: II. QUANTITATIVE ASPECTS OF WINTER PLANKTON AND ITS RELATION TO PHYSICAL AND CHEMICAL ASPECTS OF THE ENVIRONMENT (IN SPANISH),
Concepcion Univ. (Chile). Dept. of Botany.
V. Dellarossa, E. Ugarte, and O. O. Parra.
Bol Soc Biol Concepcion 50, p 87-102, 1976.

Descriptors: *Eutrophication, *Phytoplankton, Lagoons, *Chile, Water pollution effects, Oligotrophy.

Winter studies of 3 lagoons in the region of Concepcion, Chile, were made. Physical and chemical conditions were correlated with qualitative and quantitative features of the phytoplankton. The results indicated eutrophication in Lo Mendez lagoon and oligotrophy in La Posada and Chica de San Pedro lagoons.--Copyright 1978, Biological Abstracts, Inc.
W79-00577

CADMIUM ACCUMULATION BY THE MARINE RED ALGA PORPHYRA UMBILICALIS,
Aberdeen Univ. (Scotland). Dept. of Biochemistry.
M. W. McLean, and F. B. Williamson.
Physiologia Plantarum, Vol. 41, No. 4, 1977, p 268-272. 9 fig, 25 ref.

Descriptors: *Cadmium, *Zinc, *Porphyra umbilicalis, *Bioaccumulation, *Light, *Equilibrium, Heavy metals, Algae, Rhodophyta, Marine algae, Absorption, Hydrogen ion concentration, Darkness, Photosynthesis, Proteins, Cycloheximide, Autoradiography, Pollutants, Anabolism, Kinetics.

Cadmium accumulation by the marine red alga Porphyra umbilicalis under various light conditions was found to result from an ongoing anabolic process, and not the consequence of a pH gradient as provided by photosynthesis. Use of the protein synthesis inhibitor cycloheximide reinforced this conclusion, demonstrating that de novo protein synthesis is a prerequisite for cadmium accumulation. Autoradiographs show a specific intracellular location for bound cadmium, apparently the nucleus. Cadmium does not behave like zinc in several respects: (1) Light is essential for sustained cadmium accumulation, while zinc uptake is similar in light and darkness, despite reports that it is light-dependent. (2) The lag period before light stimulation occurs is much longer for cadmium (about 30 hrs) than for zinc (under one hr). (3) pH has a decisive effect on zinc accumulation. (4) Regarding uptake kinetics, zinc equilibrium is attained in only about 35 hrs in both light and darkness. Kinetics are initially first order with respect to plant mass, and rapidly approach equilibrium, with a final concentration factor of 255 reported. In contrast, a steady state for cadmium was only obtained in darkness or with cycloheximide; equilibrium was never achieved in the light even after 600 hrs and accumulation rate was directly proportional to plant mass, with metal concentration in solution not being significantly affected. (Lynch-Wisconsin)
W79-00578

DIFFERENCES IN PRODUCTIVITIES BETWEEN THE GREAT AUSTRALIAN BIGHT AND THE GULF OF CARPENTARIA, AUSTRALIA, IN SUMMER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
S. Motoda, T. Kawamura, and A. Taniguchi.
Marine Biology, Vol. 46, No. 2, 1978, p 93-99. 5 fig, 1 tab, 14 ref.

Descriptors: *Great Australian Bight, *Gulf of Carpentaria(Australia), *Phytoplankton, *Zooplankton, *Productivity, *Nutrients, *Bays, *Gulfs, Australia, Standing crops, Chlorophyll, Primary productivity, Biomass, Species composition, Algae.

Phytoplankton standing crop and primary productivity, along with zooplankton biomass, were much higher in Australia's Gulf of Carpentaria (north coast) than in the Great Australian Bight (south coast) as recorded on cruises in December 1965 (Great Australian Bight) and December 1968 (Gulf of Carpentaria). The unexpectedly low values for the bight are attributable to lack of nutrient replenishment from land or upwelling of deep water. Average phytoplankton standing crop was 27.3 mg chlorophyll-a/sq m in the gulf and 12.1 mg in the bight, average primary productivity was 133.1 mg C/sq m/hr in the gulf and 18.2 mg in the bight, and average zooplankton biomass was 305.3 mg wet wt/cu m in the gulf and 7.1 mg in the bight. Vertical stratification, which generally prevents nutrient replenishment in the euphotic layer, was weak in the bight despite low productivity. The bight's wide opening to the ocean probably induces vertical mixing due to oceanic currents. Transparency in the bight is low, apparently due to inorganic suspensions, and the result is a shallow euphotic layer. Bight water becomes progressively nutrient-depleted closer to the coast. On the other hand, the Gulf of Carpentaria is enriched by land drainage and inflow of originally nutrient-rich water from adjoining sea areas. Gulf water is neritic, as indicated by phytoplankton composition. (Lynch-Wisconsin)
W79-00579

PARTICULARATE ORGANIC MATTER IN SURFACE WATERS OFF SOUTHERN CALIFORNIA AND ITS RELATIONSHIP TO PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, W. G. Harrison, S. W. Chisholm, and E. Stewart.
Journal of Marine Research, Vol. 35, No. 4, November 1977, p 671-696. 7 fig, 4 tab, 55 ref.

Descriptors: *Phytoplankton, *Organic matter, *Southern California Bight, *Particulates, *Surface waters, Algae, California, Oceans, Bays, Euphotic zone, Carbon, Nitrogen, Chlorophyll, Adenosine triphosphate, Zooplankton, Particle size, Abundance, Standing crops, Eutrophication, Food webs.

Distribution and quantitative relationships among several biochemical parameters were studied during six cruises (September 1974-March 1976) in the Southern California Bight to estimate the relative

contributions of plankton to total particulate organic matter. Each parameter correlated with the others, suggesting that plankton (especially phytoplankton) contributed significantly to total particulate organic matter and was dynamically related to the total. Particulate carbon, nitrogen, chlorophyll-a, adenosine triphosphate (ATP), particle count, and particle volume were measured in the euphotic zone. Particle volume and number, as determined with a Coulter Counter, apparently measured both living and nonliving organic particulates well. Phytoplankton carbon accounted for an increasing proportion of total particulate carbon as the latter increased. Seasonal changes in estimated phytoplankton carbon: chlorophyll-a ratio paralleled changes in the photosynthetic assimilation ratio accompanying seasonal changes in temperature and irradiance. Sampling of diatom and dinoflagellate blooms permitted approximate determinations of carbon, nitrogen, ATP, and chlorophyll-a per particle, and the size of dominant organisms and species mixtures. The lifetime of total particulate matter in the euphotic zone, if none were refractory, was apparently only about 1-2 weeks, and its chemical composition resembled that of plankton. (Lynch-Wisconsin)
W79-00581

ALTERATION OF SWAMP FORESTS UNDER THE EFFECT OF DRAINAGE (IN RUSSIAN),
T. K. Kapustinskaite.
Lesovedenie (4) p 18-28, 1977.

Descriptors: *Drainage, *Oligotrophy, Swamps, *Swamp forests, Water pollution, *Mesotrophy, *Lithuania, *Oxalis-acetosella, Soils, Succession, USSR, *Vaccinium-myrtillus.

In the Lithuanian SSR (USSR) swamp forest biogeocenoses become stable not earlier than 20-25 yr after draining. On peaty soils of former oligotropic swamps, drained 30-40 yr ago, in place of Pinetum sphagnosum and p. iedosum of low quality V-V(a) quality class) Pinetum iedoso-pleuro-ziosium of IV-II quality class are are formed. On the areas of mesotrophic swamps. Pinetum cariscoso-sphagnosum, Piceetum caricoso-sphagnosum and Betuletum caricoso-sphagnosum of IV-V quality class give place to highly productive (II-I) forests with cover of Vaccinium myrtillus and Oxalis acetosella L. In place of medium productive Glutinosae Alnetum caricosum and Betuletum caricosum growing on soils of marshes, highly productive Glutinosae Alnetum caricoso-mixoherbosum and Betuletum caricoso-mixoherbosum arise. Forest phytocenoses on extremely poor soils of bogs and on rich soils of marshes change little under the influence of drainage.--Copyright 1978, Biological Abstracts, Inc.
W79-00585

PIGMENT DIVERSITY IN FRESHWATER PHYTOPLANKTON. II. SUMMER-SUCCESSION IN THREE DUTCH LAKES WITH DIFFERENT TROPHIC CHARACTERISTICS,
Amsterdam Univ. (Netherlands). Limnological Lab.
G. M. Hallegraeff.
Internationale Revue Der Gesamten Hydrobiologie, Vol. 62, No. 1, 1977, p 19-39. 4 fig, 3 tab, 32 ref.

Descriptors: *Pigments, *Phytoplankton, *Succession, *Trophic level, *Chromatography, *Lakes, *Analytical techniques, Netherlands, Pool t' Hammetje(Neth.), Barlosche Kolk(Neth.), Lake Maarsseveen(Neth.), Algae, Summer, Eutrophication, Chloroplasts, Chlorophyll, Floral lists, Spectrophotometry, Carotenoids, Methodology, Margalef pigment ratio.

Spectrophotometric and paper chromatographic analyses were made of chloroplast pigments in the phytoplankton of three Dutch freshwater lakes of widely different trophic characteristics during spring and summer 1973-75 to test Margalef's pigment ratio and pigment diversity propositions as indicators of changing phytoplankton physiological state and taxonomic composition. It is concluded that pigment ratios and carotenoid:chlorophyll-a ratios are inaccurate and insensitive pigement characteristics, and that in the description of diversity of pigments there is no alternative to chromatographic analysis. The chromatographically purified chlorophyll-a fraction, together with the occurrence of breakdown products of chlorophyll-a give valuable information on the stage of growth of phytoplankton populations. The pigment fractions fucoxanthin, peridinin, lutein and/or chlorophyll-b, and myxoxanthophyll can be used to indicate the contribution of the different major algal types to total phytophankton community pigments. In this way chromatographic pigment analysis may be an important tool in the description of phytoplankton community structure, particularly when used with results of microscopic phytoplankton analysis. The lakes studied, in order of decreasing lake fertility, were Pool 't Hammetje, Barlosche Kolk, and Lake Maarsseveen. (Lynch-Wisconsin)
W79-00595

ALGAE OF BIOLOGICAL PONDS OF THE CHERKASSY CHEMICAL INDUSTRY (IN UKRANIAN),
Cherkasskii Pedagogical Inst. (USSR). Div. of Botany.
H. P. Oliinyk.
Ukr Bot Zh 34(1), p 39-42, 1977.

Descriptors: *Algae, *Ponds, *Industrial wastes, *Phytoplankton, *Chemical wastes, Chemical industries, Ecology, *Scenedesmus, *Ukrainian-SSR, USSR.

Studies were conducted in phytoplankton of biological ponds of the Cherkassy chemical enterprises, (Ukrainian SSR, USSR). Found were 83 taxons in the species and intraspecies rank which belonged to 5 sections of alga. Scenedesmus quadricauda (Turp.) Breb. and S. acuminatus (Lagerh). Chod. developed in mass, almost without mixtures of other algae. Contrary to the biological ponds described in literature, this pond was characterized by a relatively small species variety, explained by constant environmental conditions.--Copyright 1978, Biological Abstracts, Inc.
W79-00611

A METHOD FOR ESTIMATING THE REGIONAL EFFECTS OF LAND USE ON RIVER-WATER QUALITY, SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
D. J. Lystrom, and F. A. Rinella.
In: Proceedings of the 4th Joint Conference on Sensing of Environmental Pollutants, held in New Orleans, Louisiana, November 6-11, 1977: American Chemical Society, p 732-738, 1978. 3 fig, 2 tab, 16 ref.

Descriptors: *Model studies, *Regression analysis, *Water quality, *Drainage area, *Geomorphology, Land use, Sediments, Suspended load, Climatology, Streamflow, Flow characteristics, Topography, Soils, Equations, Analytical techniques, New York, Pennsylvania, *Susquehanna River basin.

This paper presents a framework for compiling available data for assessing statistical relationships between water quality and several factors of climate, physiography, and land use. Eleven water-quality properties were compiled for 85 subbasins in the Susquehanna River basin in Pennsylvania and New York. Water-quality properties are calculated loads or mean concentrations of suspended sediment, dissolved solids and various chemical species of nitrogen and phosphorus. Up to 57 basin characteristics were compiled for each of the 85 subbasins from available data sources. These characteristics represent six general categories: (1) climate, (2) topography, (3) geology, (4) soils, (5) streamflow, and (6) land use. Multiple linear regression equations were developed relating water-quality properties to basin characteristics. Usable regression equations were defined for 10 of the 11 water-quality properties. These equations explain from 58 to 89 percent of the variation of the water-quality properties, with standard errors of estimate ranging from 17 to 75 percent. The 10 equations can be used to estimate water quality at specific stream sites or to simulate the generalized effect of a specific basin characteristic, such as land use, on water quality. (Woodard-USGS)
W79-00622

SCHISTOSOMIASIS DISTRIBUTION IN THE YEMEN ARAB REPUBLIC (IN RUSSIAN),
Volgogradskii Gosudarstvennyi Meditsinskii Inst. (USSR). Div. of Biology.
N. V. Bel'gesov, and G. R. Yarulin.
Med Parazitol Bolezn 45(4), p 403-404, 1976.

Descriptors: Biomphalaria-sp, Bulinus-sp, *Distribution, *Human diseases, Pathology, *Schistosomiasis, Uro, *Yemen Arab Republic.

Studies of intestinal and urogenital schistosomiasis distribution in the 6 provinces of Yemen indicate that while both forms are found in all provinces, the urogenita form is more common in the north and the intestinal form more common in the southern mountains. Less extensive invasion of both forms was observed in the coastal region. A study of 669 women in the San'a area revealed 4.7% with urogenital and 3% with intestinal schistosomiasis. More frequent invasion of men may be due to involvement in all aspects of irrigation and close contact with water. A test of 1518 Biomphalaria and Bulinus mollusks from natural water and reservoirs in the vicinity of San'a revealed that 171 (11.26%) of the specimens were hosting schistosome cercaria.--Copyright 1977, Biological Abstracts, Inc.
W79-00633

ASSESSING THE SOCIAL IMPACTS OF OIL SPILLS. PROCEEDINGS OF AN INVITATIONAL SYMPOSIUM.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-00661

THE CHEMICAL COMPOSITION AND HYDROCHEMICAL REGIME OF THE WATER IN LAKE VIITNA LINAJARV (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
H. Simm, H. Starast, U. Malgi, and A. Lindpere.
Eesti Nsv Tead Akad Toim 24(4), p 295-308, 1975.

Descriptors: *Lake Viitna Linajarv(USSR), *Hydrochemistry, *Lakes, Color, Conifers, Forests, Gas regime, Macrophytes, Minerals, Phytoplankton, Soil, Water pollution effects.

Lake Viitna Linajarv is a seepage lake situated in a sandy area covered with coniferous forests. The lake feeds on phreatic water whose chemical composition is formed by the percolation of precipitation water through soil poor in organic substances and carbonates. The formation of the chemical composition of water has been influenced strongly by autochthonous factors, such as the copious occurrence of water vegetation, especially phytoplankton, and bottom mud which accumulated due to the decaying of macrophytes and phytoplankton. Human activity has induced the plant growth and the mud accumulation. The water color, the mineral dynamics and the gas regime in the lake have changed.--Copyright 1978, Biological Abstracts, Inc.
W79-00662

ICHTHYOLOGICAL AND HYDROLOGICAL OBSERVATIONS AND STUDIES ON YARINA COCHA, NEAR PUCALLPA AND ON THE RIO PACAYA (CENTRAL AND LOWER UCAYALI, E PERU), (IN GERMAN),
Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (West Germany).
K. H. Lueling.
Zool Beitr 21(1), p 29-96, 1975.

Descriptors: Water analysis, Eutrophication, Water pollution effects, Anabaena, Chironomus, Fish, *Hydrological studies, *Ichthyological studies, Microcystis, Oscillator, Pacaya, *Peru, Phytoplankton, Pucallpa, *Rio, Ucayali(Peru), *Yarina Cocha.

The biological-hydrographical conditions of the Yarina Cocha, situated in Peru, and its fish stock are discussed. A complete water analysis characteristic of the time of floods is included. During low water (in which the lake is separated from the river Ucayali) the water of the Cocha is of a greenish-dark grey color, sometimes with a tinge of greenish-blue, depending on the development of Microcystis, Anabena and Oscillatoria. Swarms of mosquitoes of the genus Chironomus are found above the water of the Cocha and its banks, particularly during the time of low water. At the end of July and during Aug. regular fluorescence of the water occurs due to a bloom of phytoplankton.--Copyright 1977, Biological Abstracts, Inc.
W79-00668

EFFECTS OF A COASTAL FRONT ON THE DISTRIBUTION OF CHLOROPHYLL IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W79-00699

ANALYSES OF AROMATIC HYDROCARBONS IN INTERTIDAL SEDIMENTS RESULTING FROM TWO SPILLS OF NO. 2 FUEL OIL IN BUZZARDS BAY, MASSACHUSETTS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology; and Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-00719

LONG-TERM FATE OF A HEAVY FUEL OIL IN A SPILL-CONTAMINATED B.C. COASTAL BAY,
Institute of Ocean Sciences, Sidney (British Columbia).
W. J. Cretney, C. S. Wong, D. R. Green, and C. A. Bawden.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 521-527, May 1978. 4 fig, 2 tab, 14 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Biodegradation, Water pollution effects, Environmental effects, Intertidal areas, *Outer Continental Shelf, British Columbia, Fuel oil, Petroleum hydrocarbons.

The fate of accidently spilled No. 5 fuel oil in a small coastal bay in British Columbia was observed 6 times during 4 years. The oil's composition was first changed by loss of the lower molecular weight components by evaporation and dissolution. Biodegradation accounted for almost complete removal of n-alkanes in the 1st year. Pristane and phytane were biodegraded more slowly, but were almost completely gone in 4 years. The non-n-alkane components in the nC28-36 range seem to be the most resistant to degradation of all the components resolved in the gas chromatograms. The resistance to degradation of these components indicates their potential for long-term studies of oil spills. (Sinha-OEIS)
W79-00720

RESIDUES OF BUNKER C OIL IN CHEDABUCTO BAY, NOVA SCOTIA, 6 YEARS AFTER THE ARROW SPILL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W79-00721

CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W79-00722

PRELIMINARY ASSESSMENT OF THE PRESENCE OF OIL IN THE ECOSYSTEM AT EKOFISK AFTER THE BLOWOUT, APRIL 22-30, 1977,
Torry Research Station, Aberdeen (Scotland).
P. R. Mackie, R. Hardy, and K. J. Whittle.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 544-551, May 1978. 4 fig, 6 tab, 19 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Water pollution effects, *Ecosystems, *Oil pollution, Environmental effects, *Outer Continental Shelf, North Sea, Platform Bravo, Hydrocarbons.

The marine environment in the Ekofisk area was assayed for the presence of oil components after the blowout on Platform Bravo was brought under control. Several methods of assay were used but the results were not always strictly comparable. Relatively high fluorescence values were observed in water samples in the vicinity of the platform. However, gas-liquid chromatography of these samples indicated that although some of the hydrocarbon fractions now resembled crude oil, none had increased markedly in concentration. The presence of oil could be detected in the biota and taste panels were able to identify an oily taint at low level in some fish caught near the platform. A second survey some 2 mo after the spill indicated that little, if any, oil from the blowout remained in the water column. (Sinha-OEIS)
W79-00723

WEATHERING CHARACTERISTICS OF PETROLEUM HYDROCARBONS DEPOSITED IN FINE CLAY MARINE SEDIMENTS, SEARSPORT, MAINE,
Bowdoin Coll., Brunswick, ME. Dept. of Chemistry; and Bigelow Lab. for Ocean Sciences, Boothbay Harbor, ME.
D. W. Mayo, D. S. Page, J. Cooley, E. Sorenson, and F. Bradley.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 552-562, May 1978. 20 fig, 2 tab, 7 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Sediments, *Oil spills, *Environmental effects, *Weathering, Water pollution effects, Clays, Clams, Maine, *Outer Continental Shelf, Petroleum hydrocarbons, Mya arenaria.

Further examination of the 1971 spill site in Long Cove, Searsport, Maine, has been carried out during 1976, and has led to the following observations: (1) Petroleum residues isolated from this spill give the appearance of weathering particularly slowly in the cold anoxic sediments of Long Cove. (2) Leaching from contaminated terrestrial sediments onto portions of the intertidal zone on the west shore of the Cove while continuing in trace concentrations does not appear to be making a major contribution to the maintenance of a nearly steady state pollution problem found in several areas of the Cove. (3) On the average, the spill area currently appears to contain roughly 20% less material than in 1971. At a number of sites, however, there appears to have been either little or no decline in gross hydrocarbon concentrations, and essentially no weathering of the aliphatic portions of the petroleum residues. (4) One of the principal factors to influence the character of petroleum residues isolated 5 yr postspill appears to have been the weathering of the hydrocarbons during transport to the site of sediment penetration from upland locations. Thus, the current distribution was determined early in the spill period. (5) Repopulation of the Cove by M. arenaria, which is proceeding very slowly, correlates directly with the gross concentration variations of petroleum hydrocarbons. (Sinha-OEIS)
W79-00724

MECHANICAL DISPERSAL OF OIL STRANDED IN THE LITTORAL ZONE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5G.
W79-00725

UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS,
Battelle Pacific Northwest Labs. Sequim, WA, Marine Research Lab.
G. Roesijadi, J. W. Anderson, and J. W. Blaylock.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 608-614, May 1978. 1 fig, 3 tab, 22 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil pollution, *Sediments, *Arctic, Benthos, Environmental effects, Water pollution effects, *Outer Continental Shelf, *Hydrocarbons, *Aromatic hydrocarbons, Petroleum hydrocarbons, Deposit feeders, Test species, Macoma inquinata, Phascolosoma, Protothaca.

Selected benthic animals were exposed to marine sediments contaminated with Prudhoe Bay crude oil, and uptake of hydrocarbons was monitored under various experimental schemes. When uptake of aliphatic and diaromatic hydrocarbons by two deposit feeders, Macoma inquinata and Phascolosoma agassizii, was compared with that of a suspension feeders, protothaca staminea, it was found that the deposit feeders generally accumulated hydrocarbons to a greater extent than the suspension feeder. However, other factors, such as the intrinsic capabilities of species to accumulate hydrocarbons, also played an important role in the extend of contamination. Hydrocarbon concentations in the bivalve species (M. inquinata and P. staminea) increased during the 60-day exposure period; whereas concentrations in the sipunculid Phascolosoma agassizii appeared to have reached an equilibrium relatively early in the exposure. Experiments on uptake of 14C-phenanthrene, -chrysene, -dimethylbenz (a) anthracene, and -benzo (a) pyrene by M. inquinata indicated that compounds directly associated with sediment were less available for uptake than those released from sediment to the surrounding seawater. Additionally, the heavier molecular weight aromatic compounds tended to be more concentrated in tissue and retained for longer periods of time than the lighter compounds. (Sinha - OEIS)
W79-00730

ECOLOGICAL AND PHYTOHISTORICAL INVESTIGATIONS OF LOWLAND BOG PLANT BIOTOPES OF OMBROTROPHIC BOG WITH SPECIAL RESPECT TO ITS POOLS AND LAKES IN NORTHWESTERN GERMANY, (IN GERMAN),
Kiel Univ. (West Germany). Botanisches Inst.
K. Mueller.
Beitr Biol Pflanz. 49(2), P 147-235, 1973.

Descriptors: Ammonium, *Biotopes, Bird, *Bogs, Bryophytes, Calcium, Carex-limosa, Dicots, Droppings, *Ecological, *Germany, Historical, Indicators, Lakes, Lowlands, Magnesium, Minerals, Monocots, Nitrates, *Studies, Ombrotrophic, Phosphates, Phytoplankton, Pools, Potassium, Pteridophytes, Sodium.

In ombrotrophic bogs fen plants only grow in certain habitats, especially in the region of flarks, soaks and pools. the main research was done in the well known mires of kAhlenmoor and Esterweger Dose/Westermoor, especially in and around the pools. The plants of 6 smaller pools are drawn on a map presenting the dominating pool carpet-Sphagna, the mineral soil water indicator plants as well as certain ombrominerabionta which concentrate here. It could be proved that the dynamics of succession in the Sphagnum carpets of the pools can be much greater than in full-growing hummock-holow complexes. Edaphic, hydrotopographic and microclimatic characteristics explain the conditions ofthe analysis of the vegetation in the region of fen plat habitats; the influence of animals on the mires was examined; furthermore pH, O2 content and the quantities of Na, Mg, K, Ca, P2O5, NH3 and NO3 in the water were analyzed and compared and were critically evaluated. The excrements of birds may cause an enrichment of N, P, andK by a maximum of 2 mg/l/yr. These results lead to a discussion of the occurrence of the bryophytes, pteridophytes, monocots and dicots found. Higher concentrations of nutritive substances in the waters lead to much richer growing but by no means are these concentrations necessary for the existence of the euminerobionta. Comparison with conditions of the other mires in the middle of Europe shows that, in interpreting the causes of the bog distribution, ranges of the ombrominerobionta as well as of the euminerobionta in ombrotorphic habitats regionally, the climate isthe most important.--Copyright 1974, Biological Abstracts, Inc.
W79-00732

ALTERATIONS IN GROWTH AND PHYSIOLOGY OF SOFT-SHELL CLAMS, MYA ARENARIA, CHRONICALLY OILED WITH BUNKER C FROM CHEDABUCTO BAY, NOVA SCOTIA, 1970-76,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
E. S. Gilfillan, and J. H. Vandermeulen.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 630-636, May 1978. 4 fig, 3 tab, 21 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Water pollution effects, *Environmental effects, *Clams, *Oil spills, Oil pollution, Growth, Physiology, *Outer Continental Shelf, Nova Scotia, Mya arenaria, Petroleum, Bunker C oil.

Two populations of soft-shell clam, Mya arenaria, one from a chronically oiled lagoon (since the Arrow oil spill in 1970) and the other from a nonoiled lagoon, were compared as to population structure, growth, and metabolism. The oiled lagoon sediments contained up to 3800 micro g/g oil (UV determination), and clams up to 200 micro g/g hydrocarbon in their tissues (fluorescence). The oiled population of clams differed from the nonoiled population in lower total numbers with fewer mature adults, a 1-2-yr lag in tissue growth, a lower shell growth rate, and a reduced carbon flux with a lower assimilation rate. Results are interpreted to indicate that the recovery potential of M. arenaria in these oiled sediments is low and that these oiled populations remain under continued stress 6 years after the Arrow spill. (Sinha-OEIS)
W79-00733

STUDIES ON A SALINE LAKE ECOSYSTEM,
Australian National Univ., Canberra. Dept. of Environmental Biology.
For primary bibliographic entry see Field 2H.
W79-00734

STRUCTURE AND DYNAMICS OF THE FRENCH UPPER RHONE ECOSYSTEMS: II. HYDROLOGICAL AND ECOLOGICAL STUDY OF SOME BACKWATERS: FIRST RESULTS (IN FRENCH),
Lyon-I Univ., Villeurbanne (France). Dept. de Biologie Animaux et Zoologie.
J. Juget, C. Amoros, D. Gamulin, J. L. Reygrobellet, and M. Richardot.
Bull Ecol 7(4), p 479-492. 1976.

Descriptors: *Eutrophication, Waste waters(Pollution), Ecosystems, *France, Water pollution effects, Rivers, *Rhone River.

As a contribution to the general study of the French upper Rhone ecosystems, the morphometric and hydrologic characters of 2 ancient arms of the river, the Lone des Pecheurs and the Grande Lone, near Jons-Villette d'Anthon, below the point where the Rhone receives the Ain river were studied. These ancient arms or lones are silting up and are unstable, aquatic ecosystems. The more recent Lone des Pecheurs, is still connected with the main river and is influenced both by the varying level of the former and by the discharges from the phreactic waters. The border effect appears in the form of upstream to downstream gradients the sign and the amplitude of which depend on the nature of the parameters considered. The Grande Lone, now cut off from the main stream, has become very eutrophic, this character being enhanced by wastewater discharge.--Copyright 1978, Biological Abstracts, Inc.
W79-00735

BACTERIOLOGICAL INVESTIGATIONS OF SEA WATER ALONG THE DUTCH COAST: 1971 AND 1972, (IN GERMAN),
Rijksinstituut voor de Volks gezondheid, Bilthoven (Netherlands). Lab for Zoonosen Lebensmittelmikrobiology.
E. H. Kampelmacher, A. W. Fonds, and L. M. Van Noorle Jansen.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 157(4), p 313-327, 1973.

Descriptors: Aan, *Bacteriological studies, Bathers, Chlorides, Coasts, Coliforms, Dutch, E. coli, Frisian, Ijmuiden, Islands, Katwijk, Netherlands, Noordwijk, Salmonella, Scheveningen, *Sea water, Sewage, Streptococci, Wind, Zee.

The bacteriological quality of the sea water along the Dutch coast can be said to be good, apart from a few exceptions. In a large part of the area investigated, not more than 1 Escherichia coli/ml is found. In areas with a poorer bacteriological quality of sea water, this is due to the introduction of unpurified sewage. This is especially true of the Katwijk aan Zee and Scheveningen areas (the Netherlands). When the wind blows from the south westerly direction, there is a marked increase in the impurities. In addition to the introduction of sewage already mentioned, which was greatly reduced since 1971 due to various measures, the outlets of the great rivers, which are loaded with sewage also make an important contribution. The results of the samples from the Frisian Islands and the greater part of the southern area turned out to be extraordinarily favorable. The investigations have also clearly emphasized that the bacteriological conditions of the sea water is not affected by the number of bathers. In comparison with investigations made in 1970, it is striking that the results in 1971 are much better as regards fecal contamination. From the chloride determinations it appears that another type of weather was probably involved, the 'damming up' of fresh water of the coast occurring only to a slight extent. In addition the introduction of unpurified sewage was and is being reduced, especially at Katwiik aan Zee (the mouth of the 'Old Rhine') and Scheveningen to an increasing extent. Although the area sampled was much smaller, the results for 1972 are also favorable with the exception of inner Ijmuiden. The high levels of E. coli found here were to be anticipated in connection with the outlet of the North Sea Canal. Moreover, this area has no importance as a bathing beach. The results of the investigation at Noordwiik are more unfavourable in 1972 than for 1971. The chloride content of the water also fluctuated less. Since the chloride content is only to be considered an additional determination, it follows that the highest MPN (most probable number) at Noordwijk (3.7.72) does not coincide with the lowest chloride content (10.4.72). The absence of Salmonella emphasizes that infections with these organisms while bathing or swimming in the sea on the Dutch coast are still not to be feared.--Copyright 1974, Biological Abstracts, Inc.
W79-00737

SESTON AND SEDIMENT FORMATION IN FIVE LAKE DISTRICT LAKES,
Freshwater Biological Association, Ambleside (England).
W. Pennington.
J Ecol. 62(1), p 215-251, 1974.

Descriptors: Accumulation, Algae, Calcium, Carbon, Cesium-135, England, Eutrophication, Hypolimnion, Iodine, Lakes, Morphometry, Nitrogen, Postglacial, Potassium, *Productivity, *Sediments, *Seston.

Seston (total particulate matter in lake water) was collected in traps and measured over at least 1 annual cycle in 5 Lake District lakes (England), of contrasted morphometry and productivity. The organic fraction was estimated in all lakes, total N and I in 3, and in Blelham Tarn samples were analyzed monthly for C, N, I, K and Ca. The depth represented by the annual catch of seston was compared with the depth of the present annual increment to the sediments, as determined from distribution of fallout 137Cs (present in the atmosphere since 1954). Conclusions reached were: in shallow lakes resuspension and recirculation of once deposited material, particularly at the time of the autumn breakdown in stratification, resulted in seston catches of twice the volume of the permanent increment to the sediments, whereas in the deep lakes there was no significant difference between the volume of seston trapped and the annual increment; results of analysis of autumn seston from Blelham Tarn agreed with the postulated origin in resuspended material from the bottom; though in all lakes the present annual accumulation rate exceeds the mean post-glacial rate, this excess is significantly greater in the more productive lakes-those in which evidence for some degree of eutrophication within the last 2 centuries is present in the sediment profiles; comparison of composition of seston and sediment shows a higher percentage loss of organic matter from seston in those lakes in which the hypolimnion remains oxygenated throughout the year; and that these facts point to the survival into permanent sediment of organic matter from algal production in the 2 lakes which have become eutrophic-a situation which contrasts with that which has been present in Lake District lakes through most of post-glacial time.--Copyright 1974, Biological Abstracts, Inc.
W79-00738

INFLUENCE OF ENVIRONMENTAL CONTAMINATION ON CYTOCHROME P-450 MIXED-FUNCTION OXYGENASES IN FISH: IMPLICATIONS FOR RECOVERY IN THE WILD HARBOR MARSH,

Woods Hole Oceanographic Institution, MA. Dept. of Biology.
J. J. Stegeman.

Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p668-674, May 1978. 3 fig, 3 tab, 27 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environment's held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, Marshes, Massachusetts, *Outer continental shelf, Petroleum hydrocarbons, Mummichog, Fundulus heteroclitus, Mixed-function oxygenases.

Levels of hepatic cytochrome P-450 and the catalytic functions benzo (a) pyrene hydroxylase and aminopyrine demethylase were significantly greater in populations of mummichog, Fundulus heteroclitus, sampled from contaminated marshes than in those fishfrom nearby reference marshes. Aminopyrene demthylase, but not benzo (a) pyrene hydroxylase, was also elevated in fish from one of the reference marshes. The levels of cytochrome P-450 and benzo (a) pyrene hydroxylase were highest in fish from the Wild Harbor, Marsh, site of the 1969 Florida spill. A correlation between size and benzo (a) pyrene hydroxylase activity ws identified in some of the populations studied, although influence by this factor did not mask the population differences. The results are consistent with the hypothesis that elevated levels of mixed-function oxygnase activity in fish from Wild Harbor are the result of oil spilled 8 yr ago, and that recovery of this marsh is not yet complete. (Sinha - OEIS)
W79-00739

OILED SEABIRD RESCUE AND CONSERVATION,

Newcastle upon Tyne Univ. (England) Dept. of Zoology.

For primary bibliographic entry see Field 5G.
W79-00740

RECOLONIZATION OF ROCKY SHORES IN CORNWALL AFTER USE OF TOXIC DISPERSANTS TO CLEAN UP THE TORREY CANYON SPILL,

Marine Biological Association ofthe United Kingdom, Plymouth (England). Plymouth Lab.
A. J. Southward, and E. C. Southward.

Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 682-706, May 1978. 21 fig, 2 tab, 132 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Ecology, *Water pollution effects, *Environmental effects, Weathering, Algae, Intertidal areas, Toxicity, *Outer continental shelf, *Torrey Canyon, *United Kingdom, *Dispersants, *Recolonization, Rocky shores, Kuwait crude oil, Fucus, Entermorpha, Laminaria, Himanthalia.

Fourteen thousand tons of Kuwait crude oil, reduced from 18,000 tons by weathering at sea, was stranded along 150 km ofthe coast of West Cornwall, England, in March 1977. The oil was treated with 10,000 tons of toxic dispersants during cleaning operations. by itself the oil was not very toxic, although it kiled some limpets and barnacles, and most of the mortalities that followed cleaning were due to the dispersants. There was a graded effect. Most animals and some algae were killed on the shores treated heavily with dispersants, while a few animals and most algae survived in places less heavily treated. However, long stretches of coast were contaminated to some extent by drifting patches of oil and dispersants along the shore and by indiscriminate dispersants use in remote coves. The general sequence of recolonization was similar to that which has been found after small-scale experiments, where the rocks were scraped clean, or where limpets were removed, but took longer to complete. There was first a rapid 'greening' by the alga Enteromorpha; then a heavy settlement and growth of perennial brown algae (Fucus species), leading to loss of surviving barnacles. A settlement of limpets and other grazing animals followed, with eventual removal or loss of the brown alga. The final phases were a reduction in the lipet population and a resettlement of barnacles. lightly oiled, wave-beaten rocks that receie dlight dispersant treatment showed the most complete return to normal, taking about 5-8 yr; heabily oiled places that received repeated application of dispersants have taken 9-10 yr and may not be completely normal yet. (Sinha - OEIS)
W79-00741

COMPARISON OF OILED AND UNOILED INTERTIDAL COMMUNITIES IN CHEDABUCTO BAY, NOVA SCOTIA,

New Brunswick Univ., St. John. Div. of Sciences.
M. L. H. Thomas.

Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 707-716, May 1978. 3 fig, 9 tab, 23 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil pollution, *Water pollution effects, *Intertidal areas, Environmental effects, Clams, Sediments, Biota, *Outer Continental Shelf, Hydrocarbons, Nova Scotia, Mya arenaria, Littorina littorea, Petroleum hydrocarbons.

During 1976, detailed surveys of four oiled and four unoiled control stations, each subdivided into seven standardized intertidal levels, were carried out in Chedabucto Bay. Seventy-one species were found, 14 unique to control and 9 to oiled locations. Species diversity was uniformly higher at control than oiled stations. No differences in horizontal zonation of major species were apparent. Analysis of abundance and biomass data for the eight stations and seven tidal levels showed a significant overall difference between oiled and control situations. However, no particular station or tidal level was significantly different from any other. Ten species accounted for most of the variance between oiled and control stations. Six of these were more important at controls and four more important at oiled stations. The flora were particularly affected at oiled stations and species dominant on both sedimentary and rocky shores at all but the lowest tidal levels have been reduced. Length and weight data for the clam Mya arenaria showed significantly lower values at oil stations, but that for the periwinkle Littorina littorea showed the opposite. The length-weight relationship for both of these species showed a significantly lower increase in weight per unit of length at oiled than at control stations. Oiled stations showed significantly greater concentrations of oil in biota and sediments than unoiled, where concentrations were essentially at background levels. (Sinha-OEIS)
W79-00742

FLORIDA OIL SPILL IMPACT ON THE BUZZARDS BAY BENTHIC FAUNA: WEST FALMOUTH,

Woods Hole Oceanographic Institution, MA.
H. L. Sanders.

Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 717-730, May 1978. 18 fig, 3 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Intertidal areas, *Water pollution effects, *Environmental effects, Statistics, Benthos, Massachusetts, *Outer Continental Shelf, *Petroleum hydrocarbons, Subtidal zone, Species composition, Buzzards Bay(Mass).

No matter what criterion is used to measure the effects of the Florida oil spill, the densities and species composition and the array of statistical methods demonstrate that the same hierarchical pattern emerges. Densities and species composition remain stable over time at the minimally oiled and unoiled stations, but display considerable fluctuations and marked changes at the more heavily oiled stations. With simple presence or absence data, highest fidelity is present at the marginally oiled stations, lower fidelity at the intermediately oiled stations, and lowest fidelity at the severely oiled stations. The discrepancy index measures mean yearly differences in faunal composition at each of the stations. Very large and large differences are documented for the severely and intermediately oiled stations but only small differences are found for the marginally oiled stations. The coefficient of variation is a measure of faunal variability throughout the entire sampling period for each of the stations. Faunal variation remains very high at the severely and intermediately oiled stations but low at the marginally oiled sites. Cluster analysis reveals profound temporal changes in the fauna from samples collected at the severely and intermediately oiled stations but demonstrates a much more homogeneous pattern with only small seasonal changes from samples obtained at the marginally oiled stations. (Sinha-OEIS)
W79-00743

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,

Woods Hole Oceanographic Institution, MA; and Marine Biological Lab., Woods Hole, MA.
G. R. Hampson, and E. T. Moul.

Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 731-744, May 1978. 10 fig, 1 tab, 18 ref, append. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil pollution, *Salt marshes, *Ecology, *Oil spills, *Water pollution effects, *Environmental effects, Massachusetts, Invertebrates, Aquatic plants, Algae, *Outer Continental Shelf, Petroleum hydrocarbons.

On October 9, 1974 the oil barge Bouchard 65 loaded with 73,000 barrels of oil spilled what was initially thought by the Coast Guard to be a few barrels and later raised to an undetermined amount of No. 2 fuel oil off the west entrance of the Cape Cod Canal in Buzzards Bay, Massachusetts. Within the following 2-wk period, oil from the barge was found contained along the west side of Bassett's Island and inner Red Brook Harbor, a distance of 5.0 km from the site of the spillage. Qualitative samples of dead and moribund marine invertebrates were collected in tide pools and slight depressions along the beaches. A collection consisting of 4360 invertebrates comprising 105 species, plus 2 species of fish were found in 8 samples. Noticeable effects of the oil on the salt-marsh plant community were also observed. A detailed quantitative examination was begun to determine the effects of the oil on various components of the affected salt-marsh community in Winsor Cove compared to a selected control site. From the data collected in September 1977, the marsh grass in the lower intertidal zone in Winsor Cove has shown an inability to reestablish itself by either reseeding or rhizome growth. The associated sediments show a correspondingly high concentration of petroleum hydrocarbons impregnated in the peat substrate. Erosion rates measured in the af-

fected area, as a result of the 3-yr period of marsh degeneration, were 24 times greater than the control site. Microscopic algae were collected during the sampling period and those present were considered least sensitive to environmental changes. Examination of the interstitial fauna found in the study area in the summer of 1977 showed an extremely reduced number of individuals and species. (Sinha-OEIS)
W79-00744

LONG-TERM EFFECTS OF AN OIL SPILL ON FUCUS MACROFAUNA IN A SMALL BALTIC BAY,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
M. Notini.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 745-753, May 1978. 7 fig, 1 tab, 21 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Water pollution effects, *Environmental effects, Benthos, Oil pollution, *Outer Continental Shelf, Petroleum hydrocarbon, Baltic Sea, Fucus vesiculosus, Mytilus edulis, Theodoxus fluviatilis, Gammarus, Iaera, Idotea.

On October 6, 1970, the small tanker Irini ran aground in the southern part of the Stockholm archipelago, releasing about 1000 t of medium and heavy fuel oil. Approximately 400 t drifted into a small bay, Gastiviken, wiping out nearly the entire littoral fauna. Most of the oil was collected mechanically during the winter, and by May 1971 cleanup operations were completed. The recruitment of the bladder wrack (Fucus vesiculosus) community in the bay was observed at intervals over a 5-year period. Significantly increased macrofauna population densities were found for a number of species in the 1974 and 1976 samples compared to those of 1971 and 1972. From June-July 1971 to June 1976, the mean numbers of individuals for all species rose. The bivalve Mytilus edulis increased in number from 0 to about 45, the gastropod Theodoxus fluviatilis from 0 to about 160, the amphipod Gammarus spp. from about 40 to 580, the isopods Idotea spp. from about 5 to 35, and Iaera spp. from almost 0 to about 10/100 g Fucus. Larvae of Chironomidae were the only group found with a decreased density between the first and sixth summers after the spill, with 240 and 145 individuals, respectively. The data obtained are discussed in relation to conditions in a nearby unpolluted bay and to normally occurring cyclic variations. (Sinha-OEIS)
W79-00745

OBSERVATIONS OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center; and Washington State Dept. of Ecology, Olympia.
R. C. Clark, Jr., B. G. Patten, and E. E. DeNike.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 754-765, May 1978. 9 fig, 2 tab, 18 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil spills, *Water pollution effects, *Environmental effects, Intertidal areas, Washington, *Outer Continental Shelf, Hydrocarbons, Petroleum hydrocarbons.

A rich and productive intertidal community was exposed continually for over 5 yr to small quantities of a Navy Special fuel oil from the unmanned troopship General M.C. Meigs that came aground on the Washington coast in January 1972. Observations of animal and plant populations and their petroleum hydrocarbon uptake patterns showed early evidence of contamination and the persistence of the oil spill throughout the study period. Abnormal and dead urchins, and loss of algal fronds and pigment were observed in localized areas near the wreck for at least 1 yr. Within 2 mo of the accident, paraffinic hydrocarbons had been taken up by prominent members of the community and continued to appear in certain species even after 5 yr. Although changes were seen in certain species during the early days of this persistent low-level pollution incident, the community balance in this rocky, intertidal ecosystem does not appear to have been markedly altered. (Sinha-OEIS)
W79-00746

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turko (Finland). Inst. of Biology; and Turku Univ. (Finland).
E. J. Leppakoski, and L. S. Lindstrom.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 766-775, May 1978. 10 fig, 3 tab, 38 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Water pollution effects, *Oil pollution, Environmental effects, Pollution abatement, Ecology, Benthos, Sediments, *Outer Continental Shelf, Baltic Sea, Finland, Species diversity, Recolonization, Chironomus plumosus.

Quantitative field studies (density, wet weight biomass, Shannon diversity, species richness, evenness of distribution) on benthic sublittoral macrofauna were made in the vicinity of an oil refinery in southwest Finland before and after the installation of a new wastewater treatment plant that reduced the amount of oil and liquid effluents. The number of species and species diversity increased during the 1st and 2nd year after pollution abatement at the stations close to the former outflows. The amphipods Pontoporeia affinis, Corophium volutator, and C. lacustre, midge larvae of the Chironomus plumosus-group, the oligochaete Tubifex costatus, the polychaetes Harmothoe sarsi and Polydora redeki, and the bivalve Cardium sp. were the most successful recolonizers of the 23 taxa sampled. The strong lethal effect of oil-contaminated sediments upon Chironomus plumosus larvae decreased markedly in laboratory experiments. Details of postabatement succession are discussed. The results demonstrate not only the recovery from chronic oil pollution but also the degree of ecological damage caused by previous continuous discharge of oil. (Sinha-OEIS)
W79-00747

STUDIES OF THE TOXICITY OF PHOSPHO-GYPSUM,
Gdansk Univ. (Poland). Biological Station at Gorki Wschodnie.
F. Pautsch, A. Bomirski, T. Dabrowska, and G. Drewa.
Pol Arch Hydrobiol 22(3), p 449-476, 1975.

Descriptors: *Toxicity, *Phospho-gypsum, *Phosphate fertilizers, *Vistula River(USSR), Amino-acids, Atp, Balanus-improvisus, Bay, Chlorophyll, Crangon-crangon, Embletonia-pallida, Embryo, Gammarus-sp, Gasterosteus-aculeatus, Gdansk, Hemolymph, Liver, Mitochondria, Nereis-diversicolor, Perch, Pike, Platichythys-flesus, *Poland, Rhithropanopeus-harrisi-tridentatus, Shrimp.

Phospho-gypsum (a waste product formed during the manufacture of phosphate fertilizers) added to water at concentrations of 2.59g/1-15 g/l caused within 3 days 100% mortality in the following species studied: Crangon crangon, Nereis diversicolor, Gasterosteus aculeatus, Rhitropanopeus harrisi, Gammarus sp., Mytilus edulis, Embletonia pallida, Platichthys flesus. These species are listed in order of increasing sensitivity to phospho-gypsum. After 4 days 100% mortality occurred in Balanus improvisus nauplii, Rhithropanopeus megalops and fertilized pike eggs in phospho-gypsum solutions containing 2.5 g/l, 10 g/l and 5 g/l respectively. At lower phospho-gypsum concentrations, some pike eggs hatched though fewer than in controls. In phospho-gypsum solutions the embryos developed more rapidly, and larvae were smaller as compared with controls. In shrimp phospho-gypsum solutions containing 3.75 g/l and 5 g/l caused an increase in the volume of hemolymph, a drop in its total protein content and a decrease in the tyrosinase activity. Concentrations of 187 mg/l and 312 mg/l inhibited ATP synthesis in the perch liver mitochondria. The 375 mg/l concentration caused swelling and damage to the mitochondria. In adult Rhithropanopeus the concentrations of 5 g/l caused degeneration of the brain neurosecretory cells. Under experimental conditions, in water from the Dead Vistula (Poland), containing phospho-gypsum at concentrations from 197 mg/l to 1.25 mg/l, the chlorophyll-a level rose. Detergent Solo had a similar effect. Concentrations of 7 free amino acids determined in water from the Dead Vistula and the Gdansk Bay exhibited seasonal fluctuations. Highest concentrations occurred in mid Aug. The amino acid level was higher in the Dead Vistula than in the Gdansk Bay.--Copyright 1978, Biological Abstracts, Inc.
W79-00748

LONG-TERM EFFECTS OF OIL SPILLS ON MARINE INTERTIDAL COMMUNITIES,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology; and Newcastle upon Tyne Univ. (England).
K. H. Mann, and R. B. Clark.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 791-795, May 1978. 4 fig, 10 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, Oct 10-14, 1977.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, Biota, Sediments, Toxicity, Ecosystems, Arctic, *Outer Continental Shelf, Petroleum hydrocarbons.

The title of this symposium is 'Recovery Potential of Oiled Marine Northern Environments'. It is clear from the case histories of oil spills reported here that the potential for recovery is indeed present. In most cases, within 10 years of a single incident the community structure has returned to something approaching its normal state. The rate of recovery depends on many factors. One is the toxicity and quantity of oil involved; light fuel oil is much more toxic than crude oil or bunker oil and causes much greater environmental damage. Another is the nature of the shoreline on which the oil is stranded; on a high-energy, rocky shore the oil is dispersed and removed by wave action much more quickly than on a sheltered, sedimented site, where the oil may become incorporated in sediments, persist for many years, and cause chronic perturbation to the ecosystem. A third is the biology of the organisms that have been affected. Organisms with little or no mobility and slow rates of reproduction will take much longer to recolonize a damaged area than species that product large numbers of young that are widely dispersed. Since the former is a characteristic reproductive pattern for many organisms living in high latitudes, recovery of damaged arctic environments may be much slower than that of the temperate and subboreal environments that were the subject of these investigations. (Sinha-OEIS)
W79-00749

COLONIAL NESTING SEA AND WADING BIRD USE OF ESTUARINE ISLANDS IN THE PACIFIC NORTHWEST,
Graham (John) Co., Seattle, WA.
For primary bibliographic entry see Field 5E.
W79-00750

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; AN ENVIRONMENTAL INVENTORY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W79-00752

USE OF DREDGED MATERIAL ISLANDS BY COLONIAL SEABIRDS AND WADING BIRDS IN TEXAS,
Texas A and I Univ., Kingsville.
A. H. Chaney.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-8, April 1978. 317 p, 66 fig, 3 tab, 116 ref, 9 append.

Descriptors: *Birds, *Environmental effects, Islands, Habitats, *Texas, *Wading birds, Dredged material, *Dredged material disposal, *Waste disposal sites, Colonial birds.

Dredging operations in shallow coastal bays and estuaries have generated islands that have become a substrate for the development of plant and animal communities. Certain of these islands with their vegetative communities have become attractive to colonial seabirds and wading birds as nesting sites. This report assesses the environmental impact of dredged material disposal sites by gathering information on these islands in Texas waters. Thirty-four islands were selected for study, 17 in the Galveston-Houston area and 17 in the upper Laguna Madre near Corpus Christi. The islands were photographed, visited by boat, and measured as to elevation and area. More than 3000 soil samples were taken. Vegetation on each island was identified, measured, and quantified in over 3000 quadrats. Plant communities were identified and vegetation maps of each island were constructed. Birds using the islands as nesting sites were identified and their nests were monitored. Location of colonies was plotted on island maps and nesting information was summarized and placed in tabular form. Numbers and species of nesting birds were compared with those nesting on natural sites along the Texas coast. Recommendations were made concerning island construction, maintenance, and management in relation to nesting seabirds and wading birds. (WES)
W79-00753

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX A: EFFECTS OF DREDGED MATERIAL DISPOSAL ON DEMERSAL FISH AND SHELLFISH IN ELLIOT BAY, SEATTLE, WASHINGTON,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5E.
W79-00759

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, MILLER SANDS MARSH AND UPLAND HABITAT DEVELOPMENT SITE, COLUMBIA RIVER, OREGON; APPENDIX F: POST-PROPAGATION ASSESSMENT OF WILDLIFE RESOURCES ON DREDGED MATERIAL,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5E.
W79-00760

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W79-00764

THE PRODUCTION BIOLOGY OF EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM L.): A REVIEW,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
J. B. Grace, and R. G. Wetzel.
Journal of Aquatic Plant Management, Vol. 16, p 1-11, June 1978. 2 fig, 4 tab, 95 ref. NSF BMS-75-20322 ERDA EY-76-02-1599, COO-1599/131.

Descriptors: *Eurasian wate milfoil, *Reviews, *Plant physiology, *Nutrient requirements, *Limiting factors, *Primary productivity, Myriophyllum spicatum, Myriophyllum exalbescens, Aquatic weeds, Aquatic weed control, Biology, Production, Submersed plants, Macrophytes, Photosynthesis, Respiration, Carbon, Biomass, Light, Competition, Kinetics, Absorption.

High inorganic carbon-fixing efficiency is partly responsible for the success of Eurasian water milfoil (Myriophyllum spicatum) in colonizing new habitats, replacing other submersed macrophytes, and avoiding nutrient limitations, according to a review of literature on physiological aspects of the aquatic weed's productivity. Avoidance of nutrient limitation apparently is related to certain anatomical features that aid in refixation of respired carbon dioxide. Milfoil seems disadvantaged in utilizing available light (based on metabolic criteria), but its growth form compensates for any metabolic deficiencies. The ability of M. spicatum to avoid nutrient limitations (especially nitrogen and phosphorus) is probably the result of root uptake from sediments and low requirement for these minerals, rather than because of well-adapted uptake kinetics. When evaluated by quantitative criteria, milfoil is not especially productive despite excessive growth. Anatomical features, growth form, low nitrogen and phosphorus requirements, and high vegetative reproductive capacity are major factors determining the distributional and competitive success of M. spicatum. Information reviewed in this paper is important in designing control methods, in understanding competition between milfoil and other plants (particularly in regard to light), and in studies of energy flow and nutrient cycling in lakes and reservoirs. (Lynch-Wisconsin)
W79-00768

MACROPHYTE CONTROL BY HARVESTING AND HERBICIDES: IMPLICATIONS FOR PHOSPHORUS CYCLING IN LAKE WINGRA, WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W79-00771

AQUATIC WEED MANAGEMENT BY BENTHIC SEMI-BARRIERS,
State Univ. of New York Coll. at Fredonia. Environmental Resources Center.
For primary bibliographic entry see Field 4A.
W79-00774

EFFECT OF WATER LEVEL FLUCTUATION AND HERBICIDE ON EURASIAN WATERMILFOIL IN MELTON HILL RESERVOIR,
Tennessee Valley Authority, Muscle Shoals, AL. Div. of Environmental Planning.
T. L. Goldsby, and A. L. Bates.
Journal of Aquatic Plant Management, Vol. 16, p 34-38, June 1978. 3 fig, 3 tab, 6 ref.

Descriptors: *Melton Hill Reservoir(TN), *Eurasian water milfoil, *Aquatic weed control, *Drawdowns, *Herbicides, *Methodology, *Chemcontrol, Mechanical control, 2,4-D, Tennessee, Tennessee Valley Authority, Impoundments, Clinch River, Myriophyllum spicatum, Water level fluctuations, Dewatering, Winterkilling, Freezing.

The most effective and economical way to control Eurasian water milfoil (Myriophyllum spicatum) in Melton Hill Reservoir, south of Oak Ridge, Tennessee on the Clinch River, was a combination of maintenance treatments with the herbicide 2,4-D, and high frequency, short-duration winter drawdowns. M. spicatum, first observed in the reservoir in late 1965, presumably was established in spring 1964. Short-duration drawdowns during cold weather effectively reduced infestation and did not proportionally increase infestations in deeper areas. Periodic exposure to subfreezing temperatures for 2-3 days had no effect on root crown viability, which could be reduced only by prolonged exposure sufficient to freeze the hydrosoil. Herbicidal treatment with the butoxyethanol ester and dimethylamine salt of 2,4-D at a rate of 22.5-45.0 kg acid equivalent/ha was effective against the plant. The drawdown and herbicide treatment schedule 1971-76 involved: (1) 1971-72--low water levels maintained mid-October to mid-February. (2) intermittent low water level mid-June to September 1972. (3) 1973-75--normal water level (about 241.5-242.1 m MSL), with 2,4-D treatment during the growing season. (4) 1975-76 and 1976-77--2-3 day drawdowns twice per month from August or September to March, with 2,4-D treatment during the growing season. The drawdown schedule for 1975-76 was as effective as the long-term drawdown of 1971-72. (Lynch-Wisconsin)
W79-00775

CHEMICAL CONTROL OF HYDRILLA,
Corps of Engineers, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-00776

TOXICITY OF SULFURIC ACID TO AQUATIC PLANTS AND ORGANISMS,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
L. L. Trent, R. S. Hestand, III, and C. C. Carter.
Journal of Aquatic Plant Management, Vol. 16, p 40-43, June 1978. 3 fig, 13 ref.

Descriptors: *Toxicity, *Hydrilla verticillata, *Sulfuric acid, *Aquatic weed control, *Environmental effects, Acids, Fish, Aquatic animals, Insects, Bioassay, Hydrogen ion concentration, Najas guadalupensis, Vallisneria americana, Chara, Midges, Shrimp, Snails, Scuds, Mosquitofish, Largemouth bass, Micropterus salmoides, Gambusia affinis, Hyallela azteca, Palaemontes, Chironimidae, Planorbidae.

Field applications of sulfuric acid are more harmful to aquatic fauna than to Hydrilla verticillata and other aquatic weeds. Bioassay evaluation of the acid as a control for the nuisance weeds, and of effects on selected aquatic fauna, showed that aqueous solutions of sulfuric acid at pH 3 produced no toxic effects on hydrilla, but were extremely toxic to all faunal groups. Sulfuric acid would also be hazardous to the applicator and to the public, require high dosages, and produce erratic, unpredictable results. Testing of hydrilla, southern naiad (Najas guadalupensis), Vallisneria americana, and Chara sp in 57-liter aquaria resulted in erratic and temporary plant control, and effects were generally confined to the lower portion of the plants in direct contact with the acid layer. High plant density buffered toxic effects to a great degree. Fauna and hydrilla were tested in 3.8-liter bioassay jars. Fauna included largemouth bass (Micropterus salmoides), mosquitofish (Gambusia affinis), scuds (Hyalella azteca), fresh-

water shrimp (Palaemontes sp.), midges (Chironomidae), and snails (Planorbidae). All but midges and mosquitofish were killed at pH 3 within 24 hours. Snails, scud, and shrimp were very sensitive to pH change, with all scud killed at pH 3 in six hrs and all shrimp in two hrs. Largemouth bass were very tolerant to pH 5, but at pH 3 all were dead after 24 hrs. Mosquitofish mortality at pH 3 was 60% after eight hrs, and 80% after 24 hrs. (Lynch-Wisconsin)
W79-00777

COMPARATIVE EFFECTS OF GRASS CARP AND SELECTED HERBICIDES ON MACROPHYTE AND PHYTOPLANKTON COMMUNITIES,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
R. S. Hestand, and C. C. Carter.
Journal of Aquatic Plant Management, Vol. 16, p 43-50, June 1978. 6 fig, 3 tab, 11 ref.

Descriptors: *Macrophytes, *Phytoplankton, *White amur, *Herbicides, *Biocontrol, *Aquatic weed control, *Succession, *Eutrophication, Algae, Ctenopharyngodon idella, Fish, Chemcontrol, Hydrothol, Diquat, Cutrine, Nutrients, Phosphorus, Nitrates, Degradation(Decomposition), Najas guadalupensis, Chara, Ceratophyllum demersum, Myriophyllum spicatum, Hydrilla verticillata, Vallisneria americana.

Test pools containing communities of six aquatic macrophytes were treated with the herbivorous fish white amur (Ctenopharyngodon idella), Hydrothol 191, or diquat and Cutrine Plus to test biocontrol effectiveness and side effects on phytoplankton. Herbicide treatments quickly killed all plants tested--southern naiad (Najas guadalupensis), Chara sp., coontail (Ceratophyllum demersum), Eurasian water milfoil (Myriophyllum spicatum), Hydrilla verticillata, and Vallisneria americana--but nutrients released triggered dense phytoplankton blooms. White amur (grass carp) slowly consumed the macrophytes without producing the predicted stimulatory effects on phytoplankton. Approximately equal numbers of the six plants were planted in each of 45 plastic pools 366 cm in diameter, and allowed to establish for one year. Nine pools were stocked with one white amur each, nine were controls, and the rest were treated with herbicides (detailed in a previous paper). Southern naiad was eliminated by white amur in 130 days, Chara in 180, Coontail in 200, hydrilla in 205, and water milfoil in 265. Vallisneria increased until day 240, then declined; it was the least preferred by white amur. Southern naiad declined and coontail was eliminated by competition in controls, while water milfoil increased slightly and vallisneria increased considerably in controls. Effects of treatment on water quality and phytoplankton succession are discussed. (Lynch-Wisconsin)
W79-00778

EFFECT OF PH ON THE NATURE OF COMPETITION BETWEEN EICHHORNIA CRASSIPES AND PISTIA STRATIOTES,
Khartoum Univ. (Sudan).
M. Tagel Seed.
Journal of Aquatic Plant Management, Vol. 16, p 53-57, June 1978. 2 fig, 3 tab, 17 ref.

Descriptors: *Water hyacinth, *Hydrogen ion concentration, *Competition, *Ecology, *Water lettuce, *Limiting factors, Niches, Eichhornia crassipes, Light, Space, Aquatic plant, Pistia stratiotes, Floating plants, Acids, Plant growth.

Greenhouse experiments to test effects of various pH levels (4,7, and 9) on space competition between water hyacinth (Eichhornia crassipes) and water lettuce (Pistia stratiotes) showed Eichhoria to hae a clear advantage in mixed cultures, sometimes completely displacing Pistia. Plants of comparable size were chosen from natural populations. Five treatments were studied: a monoculture of each species and three mixed cultures in which each plant represented 25%, 50%, or 75% of the population, while initial overall density was kept constant at four plats. Plants were grown in three-liter plastic containers in 2% standard Long-Ashton culture solution; pH was adjusted using 5% sulfuric acid (with additions of anhydrous sodium sulfate) or 10% for 48 hrs, and dry weights determined. The Pistia monoculture indicated pH 4 was optimum for dry weight growth. Eichhornia yield decreased with increase in its proportion in mixed cultures at all pH levels, suggesting greater intraspecific than interspecific competition, but at all pH levels Eichhornia was the gaining species and Pistia the losing species. The number of Eichhornia plants remained constant in all cultures, Probably due to container limitation. The results demonstrate that the critical competitive element was limited surface (i.e., Light). (Lynch-Wisconsing)
W79-00780

THE EFFECT OF DAYLENGTH AND TEMPERATURE ON HYDRILLA GROWTH AND TUBER PRODUCTION,
Florida Univ., Gainesville.
T. K. Van, W. T. Haller, and L. A. Garrard.
Journal of Plant Management, Vol. 16, p 57-59, June 1978. 2 fig, 1 tab, 10 ref.

Descriptors: *Hydrilla verticillata, *Tubers, *Plant growth, *Water temperature, *Photoperiods, *Reproduction, Aquatic plants, Aquatic weed control, Light, Day length, Florida, Seasonal, Growth stages, Life cycles.

Pool studies in northern Florida (1976-77) of tuber formation by Hydrilla verticillata confirmed an earlier report that tuberization occurred October-April; a sharp decline noted December-January was due to cold weather. Growth chamber studies indicated the seasonal tuber production was production was primarily a response to short-day stimulus. Critical day length for tuberization apeared to be 13 hrs. No tubers were formed May-August when vegetative growth was greatest. Temperature had a marked effect on hydrilla growth ad tuber production; with maintenance of a 10-hr photopeiod, tuberization increased with increasing temperatures up to 33 C. At 9 C no tubers were formed, indicating that cold temperature was the primary reason for the drop in tuberization in mid-winter in the pool studies. Increased tuberization at higher temperatures was associated with a general increase in vegetative growth. Under tuber-inducing conditions (10-hr photoperiod), Tuberization appeared to depend on a adequate supply of phtosynthate. Higher temperatures during growth probably permitted more rapid photosynthate production, resulting in more tubers and larger size. in contrast with several other plants, cold water temperature is not required for hydrilla tuberization. Because of the temperature effect, maximum tuber production in the South may occur in fall and winter, but in the north only in fall. (Lynch-Wisconsin)
W79-00781

MACROINVERTEBRATES AND DIATOMS ON SUBMERGED BOTTOM SUBSTRATES, LAKE POWELL,
New Mexico Univ., Albuquerque. Dept. of Biology.
L. D. Potter, and E. Louderbough.
Available from the National Technical Information Service Springfield, VA 22161 as PB-272 692, Price codes: A04 in paper copy, A01 in microfiche. Report NSF/RA-770232, March 1977. 46 p. 5 fig, 3 tab, 31 ref, 1 append.

Descriptors: *Lake Powell(AZ UT), *Macroinvertebrates, *Diatoms, *Methodology, *Artificial substrates, *Periphyton, *On-site data collections, *Bottom sampling, Chironomids, Larvae, Reservoirs, Lakes, Arizona, Utah, Algae, Species composition, Species diversity, Diversity indices, Physa, Snails, Dermatitis, Human diseases, Baseline studies, Substrates, Biological communities, Fish food organisms, Water level fluctuations.

Plastic Christmas trees 57 cm tall were successfully used as artifical substrates to study the macroinvertebrate and diatom periphytic community in the littoral of Lake Powell (Arizona-Utah). The technique permitted collection, processing, and quantification of organisms associated with inundated vegetation. The trees were planted along a sloping sandy bottom at depths of 2, 3, 4, 5, 6, 8, and 10 meters, and at 4- and 12-week intervals between July 1973-October 1974, the trees were harvested using plastic bags, organisms were removed and the trees were replanted. Density and species composition were determined, and a diversity index was computed for the diatom component. Data indicate the organisms associated wth inundated vegetation constitute an improtant part of available fish food in the lake's littoral zone. Of macroinvertebrates, 95% were chironomid larvae (95% Dicrotendipes). Snails of the genus Physa, which can function as hosts for schistosome-dermatitis-producing cercariae, were found to concentrate on trees submerged for 12 weeks. The potential heath problem may impair recreational use of the lake, especially as shoreline biolmass increases. Though Lake Powell's aquatic community is developing in a manner similar to other man-made lakes, fluctuating water level and high sediment load produce a changing bottom substrate. A major remaining procedural problem is separation of fine silt from orgaisms. (Lynch-Wisconsin)
W79-00782

PLANKTON COMMUNITY STRUCTURE: EVALUATION OF ANALYTICAL METHODS USING MODEL COMMUNITIES,
Georgia Univ., Athens. Dept. of Zoology.
W. B. Hayes.
Available from the National Technical Information Service, Springfield, VA 22161 as SR0-852-2. Price codes: A06 in paper copy, A01 in microfiche. ERDA Report No. SR0-852-2, July 1976. 110 p. 9 fig, 13 tab, 19 ref, 1 append. AT(38-1)852.

Descriptors: *Computer models, *Plankton, *Analytical techniques, *Affinity tests, *Model studies, *Water pollution effects, *Statistical methods, Biological communities, Computer programs, Species composition, Effluents, Thermal pollution, Methodology, Bioindicators, Species diversity, Association analysis, Similarity, Fager test, Orloci method, Goodall index.

Three affinity tests (by FAger, Orloci, and Goodall) were evaluated for use in assessing plankton community structure as a means of measureing effects of effluents on plankton. A distribution model ws used to generate artificial data for the evaluation. The tests were: (1) Fager's recurrent group technique, (2) the Orloci sum-of-squares agglomeration method, and (3) Goodal's probabilistic similarity index. The Fager and Orloci procedures performed equally well with the model communities, but with samples taken along an outfall control line the Fager procedure was clearly superior. Problems in running the Goodall program made conclusive evaluation impossible. An appendix gives computer programs used in the study. Affinity testing can be used to supplement bioindicators and diversity indices in environental impact analysis. Also termed association analysis, affinity testing measures the degree of similarity between two or more objects, each of which is described by a set of attributes. For plankton colmmunities, the analysis can take various forms: (1) the objects can be sites, with affinity defined by the number of species in common at the sites; (2) the objects can be individual species, with affinity determined by occurrence in the same localities; and (3) the entire species list for an area can

be used as an indicator by grouping the stations; stations near the outfall may form a distinctive group. (Lynch-Wisconsin)
W79-00783

FLUORESCENCE LIFETIMES OF CHLORELLA PYRENOIDOSA,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
L. E. Harris, G. Porter, J. A. Synowiec, C. J. Tredwell, and J. Barber.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 954, Price codes: A02 in paper copy, A01 in microfiche. Biochemica et Biophysica Acta, Vol 449, 1976, p 329-339. 3 fig, 1 tab, 28 ref.

Descriptors: *Chlorella pyrenoidosa, *Fluorescence, *Equations, *Photosynthesis, *Lasers, *Degradation(Decomposition), *Measurement, Algae, Chlorophyta, Kinetics, Darkness, Picoseconds, Nanoseconds, Methodology, Research equipment.

Fluorescence decay of the green alga Chlorella pyrenoidsosa was investigated under a variety of conditions in the picosecond and nanosecond time spans. Most flurorescence was accounted for by an expression of the form I(t)=I sub o exp-(At*Bt to the one-half power), though a additional exponential term was required to include a weak component of lifetie 32 ps observable only at the higher pulse intensities. This interpretation reconciles earlier and apparently conflicting data. The weak 32 ps component may be associated with Photosystem I, although it may an artifact of the high intensity pulses used. The main fluorescence, described by the equation above, is attributed to antenna chlorophyll; its form would be expcted from a single light harvesting array with trapping at randomly distributed sites. The form of the fluorescence decay given by the equation for C. pyrenoidosa should apply to the fluorescence of all green plants. In the experiments the picosecond pulses from a mode-locked eodymium (3+) glass laser were used. Fluorescence response was detected with an IMACON 600 streak camera coupled to a vidicon multichannel analyzer. Fluorescence from a photosynthetic organism provides direct insight into the initial photochemical processes involved in photosynthesis, and the technique used here extends the time resolution of fluorescence measurement. (Lynch-Wisconsin)
W79-00784

LEAF DECOMPOSITION IN A TROPICAL RAINFOREST STREAM,
Ohio State Univ., Columbus. Dept. of Botany.
D. E. Padgett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 106, Price codes: A03 in paper copy, A01 in microfiche. Doctoral dissertation, Ohio State University Graduate School, 1975. 42 p, 11 fig, 7 tab, 47 ref, 2 append.

Descriptors: *Degradation(Decomposition), *Leaves, *Tropical regions, *Streams, *Rain forests, *Hyphomycetes, Fungi, Plant tissues, Puerto Rico, Luquillo National Forest(Puerto Rico), Spores, Proteins, Calories, Weight, Nitrogen, Enzymes, Running waters, Campylospora chaetocladia, Pyramidospora casuarinae, Triscelophorus monosporus.

Enzymatic activity of certain freshwater fungi (hyphomycetes) was a significant factor in decomposition of submerged leaf litter in a small stream in the Luquillo National Forest, a tropical rain forest in Puerto Rico. Leaf discs (1.4 cm in diameter) of Buchenavia capitata, Manilkara bidentata, and Dacryodes excelsa disintegrated completely in 26 weeks, compared with 32 weeks for Sloanea berteriana and Cordia borinquensis. Twelve hundred discs of each species were oven-dried five days at 45C, placed in 1.8-sq mm mesh screen packets, and anchored in the stream. Stream ranged from 3-32 cm in depth, and 27 cm to 2.3 m in width; base flow through its pools was normally 2-3 cm/sec. Morphological changes accompanying disintegration followed two basic patterns, depending on the rate at which epidermal layers disappeared; patterns were similar in that disintegration was restricted to localized areas within the discs. No relationship was detected between weight loss and disintegration patterns, however. Sixteen species of hyphomycetes were identified from spores in stream foam or on submergedf leaves. Campylospora chaetocladia, Pyramidospora casuarinae, and Triscelophorus monosporus appeared to be involved in decomposition because of frequent appearance on the leaf discs. No significant increases in leaf disc nitrogen content were found that could be related to fungal protein, but caloric changes during disintegration suggested increasing fungal biomass. (Lynch-Wisconsin)
W79-00785

RELATION BETWEEN AQUATIC PLANTS AND GASTROPODS (MOLLUSCA, GASTROPODA) IN THE REGION OF THE GENTILLY I NUCLEAR CENTER (QUEBEC) (IN FRENCH),
Quebec Univ., Trois-Rivieres. Dept. of Chemistry-Biology.
E. Lacoursiere, G. Vaillancourt, and R. Couture.
Can J Zool 53(12), p 1868-1874, 1975.

Descriptors: *Aquatic plants, *Canada, *Gastropods, Gentilly, *Mollusca, Nuclear powerplants, Quebec, Rivers, *Thermal pollution, Water pollution effects.

This study is based on a sampling of the gastropods present in the vegetation of the St. Lawrence riverside zone at Gentilly (Canada). A total of 536 plant specimens belonging to 20 spp. as well as 37,239 specimens of 10 spp. of gastropods were sampled. Prosobranchs have no affinity whatsoever for any plant species in particular. The pulmonates, however, are found mainly on emergent plants.
W79-00794

PHYTOPLANKTON PRODUCTIVITY IN TOMAHAWK LAGOON, LAKE WAIPORI AND LAKE MAHINERANGI,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
S. F. Mitchell.
N Z Mar Dep Fish Res Div Bull N S. 3, p 9-87, 1971.

Descriptors: *Phytoplankton, Photosynthesis, *New Zealand, *Lakes, Lagoons, *Productivity, *Lake Waipori,(NZ), Lake Mahinerangi(NZ).

In Lake Mahinerangi, a power-supply reservoir, the phytoplankton productivity as estimated by the 14C method is comparable with that in the least productive temperate lakes that have beeeen investigated. Mean rates of production in the daylight hours in 1964-65 were 2.02 mg of C/m3/hr at near-optimal light intensity (Pmax) and 76 mg of C/m2/day. Multiple regression analyses showed that 78.3% of the variation in hourly Pmax during 1964-65 could be accounted for by variations in temperature, water level, and day length. During summer and autumn, when productivity was highest, large fluctuations in productivity were recorded at the main sampling station at Lake Mahinerangi and these appeared to be related largely to variations in temperature. The annual production of O2 by photosynthesis in Lake Mahinerangi, as estimated from bottle experiments during 1963-64, amounts to only about 1/2 of the annual consumption by respiration. The concentrations of soluble reactive phosphate ranged from 0 to 3.0 mg of PO4-P/m3 ad showed no seasonal pattern of variation. Concentrations of other ionic solutes were low by comparison wth those in other New Zealand lakes. Oxygen concentrations at sunrise were within the range of 90-101% of saturation and did not vary with depth. In almost all of the samples from Lakes Mahinerangi and Waipori, which lie on the same river system, the most abundant phytoplankton were Cyclotella stelligera Cleve et Grunow and one of 2 spp. of Gymnodinium (G. limitatum Skuja and Gymnodinium sp.). Phytoplankton productivity per unit volume in Lake Waipori was slightly higher than that in Lake Mahinerangi. When the lakes were compared the mean assimilation per unit chlorophyll decreased in the same order as the mean productivity. Phytoplankton productivity, as estimated by the 14C method, varied between 36 and 88% light and dark bottle oxygen production estimates of gross productivity when the methods were compared directly in 4-hr experiments in Tomahawk Lagoo. tCopy--Copyright 1971, Biological Abstracts, Inc.
W79-00799

THE KNOWLEDGE OF THE PLANKTON OF LAKES OF GREECE: III. THE ZOOPLANKTON OF LAKE VENGORITIS. (IN GERMAN),
H. Mueller.
Folia Biochim Biol Graeca 13(3/4), p 67-90, 1976.

Descriptors: Eutrophication, *lake Vengoritis, *Phytoplankton, *Zooplankton, Water pollution effects.

Vengoritis Lake shows a wide variety of zooplankton and phytoplankton species. Many kinds are typical for this lake and are not found in other Macedonian lakes. Some of the plankton species indicate a level of eutrophy.--Copyright 1977, Biological Abstracts, Inc.
W79-00808

ZOOPLANKTON OF THE REGION OF NOSY-BE: V. CLADOCERA: CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
S. Frontier.
Cah O R S T O M Ser Oceanogr. 11(3), p 259-272, 1973.

Descriptors: Zooplankton, Bays, *Cladocera, Estuaries, Eutrophication, Evadne-tergestina, Filtration, Malagasy-Republic, Nosy-Be, Penilia-avirostris, Phytoplankton, Rainfall, Sesonal, Tropical, *Zooplankton.

Spatiotemporal variations of the populations of Penilia avirostris and Edvane tergestina are discussed. The 2 spp. belong to the internal neritic settlement; the former is more strictly coastal than the latter. The populations develop very fast in the bays (Malagasy Republic) after the 1st heavy rains (Dec.). They reach a 1st maximum level in Feb.-March and a 2nd in July-Aug. separated by an interseasonal decrease. The 1st maximum is the principal maximum for Evadne. The situation is opposite for Penilia. The populations decrease drastically in Sept. During stratification of the neritic water (wet season), Evadne remains generally in the more superficial layers than Penilia. With the surface drifting toward the open sea and the estuarine circulation prevailing at this time of the year it sweeps Penilia towards the external neritic zone. Cladoceran populations seem to follow closely the abundance variations of phytoplankton, the later being directly affected by river flow. They are an essential link in trophic chains because of the filtration power they represent. (See also W77-02416)--Copyright 1975, Biological Abstracts, Inc.
W79-00809

ENTRAINMENT AT A ONCE-THROUGH COOLING SYSTEM ON WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Inst. of Water Research; and Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. A. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 953, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-600/3-78-070, July 1978. Vol I of II, 154 p, 19 fig, 37 tab, 80 ref. R801188.

Descriptors: *Entrainment, *Electric power plants, *Lake Erie, *Cooling water, *Thermal pollution, Aquatic life, *Plankton, *Environmental effects, Zooplankton, Cyanophyta, Chlorophyta, Phytoplankton, Periphyton, Ichthyoplankton, Chloride, Fish, Larvae, Aquatic environment, Industrial water, Fish conservation, Aquatic habitats, Conservation.

The rates of entrainment and effects on important components of the aquatic community being passed once through the cooling system of the steam-electric power plant (the Monroe Power Plant) were assessed. Phytoplankton, zooplankton, ichthyoplankton, and community metabolism were sampled bimonthly over a 3-yr period at fixed locations in the intake region, discharge canal, thermal plume, and source waters of Lake Erie. Concentrations of chloride and dissolved and total solids were used to trace water masses and their associated nutrient and plankton concentrations. At temperatures above 15 C in the discharge canal, photosynthesis was depressed and community respiration was accelerated. Algal abundance increased slightly with gree and blue-green algae increasing more than other taxa during passage; however, algal diversity remained basically unchanged. Densities of zooplankton declined about 40% in the cooling system, but diversity remained unchanged and the impact was masked by mixing in the receiving waters. Larval fish were concentrated near bottom at night and moved up during the day, and there were both temporal and geographical variations in distributions; consequently, some fish larvae seemed more vulnerable to entrainment than others. Large enough numbers of certain ichthyoplanktonic species and Leptodora kindtii may be entrained to at least slightly influence population abundances of adult organisms in western Lake Erie. The regeneration rates of smaller planktonic organisms in the source waters are likely to negate the local impact of the cooling systems on their populations. (Majtenyi-IPA)
W79-00878

PHYTOPLANKTON OF ALKALINE WATERS AT KANEM (CHAD): VII. THE STRUCTURE OF POPULATIONS, (IN FRENCH),
Lab. Hydrobiol., ORSTOM, N'djamena, Chad.
A. Iltis.
Cah O R S T O M Ser Hydrobiol. 8(1), p 51-76, 1974.

Descriptors: *Chad, Kanem, *Phytoplankton, *Salinity, Species, Biological communities, *Alkaline water, Ponds, Salt balance.

Phytoplankton organization was studied in a series of natroned temporary ponds and permanent lakes. In permanent waters, the higher the salinity of the lake, the lower the species diversity. Changes in the species diversity during 1 yr are not interpretable. The variations of the equitability follow those of the species diversity. Motumura's log-linear law of distribution can be adjusted to almost all the different species abundance distributions, the constant of milieu or Motomura's constant is lower as the salt concentration of the water is high. (See also W76-09596; W75-09020; and W75-06778) Copyright 1975, (Biological Abstracts, Inc.
W79-00884

EFFECTS OF WATER QUALITY, ANTIBIOTICS, PHYTOPLANKTON AND FOOD ON SURVIVAL AND DEVELOPMENT OF LARVAE OF SCYLLA SERRATA (CRUSTACEA:PORTUNIDAE),
Univ. Hawaii, Kaneohe, Inst. of Mar. Biol.
R. W. Brick.
Aquaculture. 3(3), p 231-244, 1974.

Descriptors: *Antibiotics, Artemia-salina, B. chlorella, Crustaceans, Food, Larvae, Penicillin, Phytoplankton, Polymyxin, Portunidae, Rotifers, Scylla-serrata, Survival, Water quality, Zooplankton, Water pollution effects.

Larvae on the portunid crab S. serrata were successfully reared using a combination of antibiotics (penicillin-G + polymyxin-B), phytoplankton (Chlorella sp.) and appropriate food (Artemia salina nauplii). Antiobiotics enhanced premetamorphic survival of zoeae while leaving rate of zoeal development and success of metamorphosis to megalopa unaltered. Water filtration and ultraviolet sterilization had no significant effect on rates of zoeal survival or development. Although antibiotics did not affect metamorphosis of megalopa to the crab stage, the antibiotic mixture may have been detrimental to survival to megalopae. The presence of Chlorella, unlike antibiotics, left zoeal survival unaffected while stimulating production of megalopae. As with antibiotics, time from hatching to megalopa formation was unaltered by the presence of Chlorella. Survival and development of zoeae varied with type and concentration of food organisms used. Feeding with Artemia nauplii produced highest larval survival and continued development. Rotifers and zooplankton as a food source failed to support zoeal survival to the onset of metamorphosis and failed to enhance survival when fed in combination with Artemia nauplii. A daily optimum food concentration of 10 Artemia nauplii/ml was established for zoeal survival. Megalopae survived better at the higher food (Artemia) concentrations used and tended to develop more rapidly to the crab stage at higher food levels.--Copyright 1975, Biological Abstracts, Inc.
W79-00891

RELATIONSHIP BETWEEN CYTOPLASMIC DISTRIBUTION OF MERCURY AND TOXIC EFFECTS TO ZOOPLANKTON AND CHUM SALMON (ONCORHYNCHUS KETA) EXPOSED TO MERCURY IN A CONTROLLED ECOSYSTEM,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. A. Brown, and T. R. Parsons.
Journal Fisheries Research Board Canada, Vol 35, p 880-884, 1978. 2 tab, 33 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Toxicity, *Mercury, Salmon, Zooplankton, *Ecosystems, *Controlled Ecosystem Pollution Experiment(CEPEX), Oncorhynchus keta, International Decade of Ocean Exploration(IDOE).

Fish and zooplankton were simultaneously exposed to trace, 1, and 5 micro g Hg/L. In fish and zooplankton, pathological effects appeared to coincide with saturation metallothionein and 'spillover' of Hg into the high molecular weight protein (enzyme-containing) pool. Coincidential with increase of Hg in tissue were decreases of Cu and Zn. Pathological effects of Hg are explained in terms of tertiary and quaternary structural changes in metalloenzymes resulting from replacement of Cu and Zn by Hg. Decreases in tissue Cu and Zn with increasing Hg concentration are discussed as an intracellular displacement of Cu and Zn by Hg and as duodenal and cellular exclusion processes. (NOAA)
W79-00892

SENSITIVITY OF THREE MICROALGAE TO CRUDE OILS AND FUEL OILS,
Texas Univ., Port Aransas. Marine Science Inst.
J. C. Batterton, K. Winters, and C. Van Baalen.
Marine Environmental Research, Vol 1, p 31-41, 1978. 1 fig, 6 tab, 8 ref. Also as Texas University Marine Science Institute Contribution No. 275. NSF OCE73-09740-A01 and OCE76-83913.

Descriptors: *Algae, *Toxicity, *Oil pollution, *Water pollution effects, Environmental effects, Testing, Photosynthesis, Cyanophyta, Chlorophyta, Diatoms, Crude oils, Fuel oils, Chlorella autotrophica, Agmenellum quadruplicatus, Cylindrotheca sp., International Decade of Ocean Exploration(IDOE).

Four crude oils and five fuel oils have been tested for toxicity with three microalgae--a blue-green, a green and a diatom. The crude oils were less inhibitory than equal amounts of fuel oils. Photosynthesis of a sensitive organism Chlorella autotrophica, strain 580, was only temporarily depressed by the crude oils. Four of the fuel oils inhibited photosynthesis, O2 output decreasing to zero without recovery. Classes of aromatic compounds which were not accountable for the toxicity observed here include naphthalene, methylnapththalenes, dibenzothiophenes, phenanthrenes and compounds with volatilities greater than methylnaphthalenes. Paraffinic and asphaltic fractions of fuel oil were also non-toxic. The accumulated chemical data suggest that the toxicity of whole fuel oils is due to the less water soluble types of compounds in the higher boiling aromatic fraction. (NOAA)
W79-00894

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME I.
National Oceanic and Atmospheric Aministration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00895

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME III.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00897

DIVERSITY AND LONGITUDINAL ZONATION IN FISH POPULATIONS OF TWO STREAMS ENTERING A METROPOLITAN AREA,
Toledo Univ., OH. Dept. of Biology.
E. J. Tramer, and P. M. Rogers.
Am Midl Nat. 90(2), p 366-374, 1973.

Descriptors: Diversity(Fish), *Fish populations, Metropolitan areas, Notropis-stramineus, Water pollution, Semotilus-astromaculatus, Streams, *Zonation(Fish), *Ohio.

The distribution and relative abundance of fishes were surveyed in Swan and Tenmile creeks, Lucas County, Ohio, from their headwaters in a rural agricultural area to points near the center of the city of Toledo, Ohio. In each creek 21 spp. were found. Of the total of 27 spp. collected only 2 Semotilus atromaculatus and Notropis stramineus, occurred at each sample station. Species diversity along both streams followed no definite pattern, even when the creeks became grossly polluted, since declines in the number of species present were often offset by shifts toward relative abundances which were more evenly distributed. Fish species diversity was not correlated with an index of habitat diversity. Furthermore, unlike other longitudinal zonations, diversity was not correlated with mean depth of the stream or with

distance from the headwaters; and species composition changes took the form of replacements rather than additions to the headwaters assemblage. Pollution stress probably cancelled out the effects of factors such as substrate diversity and mean depth, thereby obliterating the normal patterns of diversity and longitudinal zonation.--Copyright 1974, Biological Abstracts, Inc.
W79-00903

THE EFFECTS OF TEMPERATURE ON THE GROWTH AND SURVIVAL OF LARVAL AND JUVENILE CRAYFISH, PACIFASTACUS LENIUSCULUS,
California Univ., Davis. Dept. of Animal Science.
J. W. Cornacchis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 435, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, June 1978. 64 p, 11 fig, 13 tab, 52 ref. (California Water Resources Center Project UCAL-WRC-W-475). OWRT A-056-CAL(4).

Descriptors: *Crayfish, *Temperature, *Thermal pollution, Thermal stress, Growth stages, *Larval growth stage, *Juvenile growth stage, *Growth rates, Water pollution effects, Mortality.

The growth and survival of compartmentalized subyearling Pacifastacus Leniusculus were studied in the laboratory at temperatures of 14.5 degrees through 25.5 degrees C. Growth in weight was maximum at 22.0 degrees C. Cephalothorcic growth was .0642 mm/day (stages II-V) at the same temperature. The temperature predicted to produce optimum growth in length for stages II to V was calculated to be 20.0 degrees C. The effects of temperature on crayfish growth were primarily due to the acceleration of developmental rates as opposed to differences in incremental growth. Hiatt graphic analysis demonstrated that the coefficient of growth ranged from 1.16 to 1.33. Mortality was proportional to thermal shock during state I. After stage I, crayfish reared at warmer temperatures had the best record of survival except at 17.0 degrees C. Morphometric analysis revealed that a linear relationship existed between diameter and weight of eggs. A new allometric model is presented that describes weight as a function of length of carapace in larval and juvenile stages (<13 mm). (Snyder-Calif Davis)
W79-00909

THE EFFECTS OF IRRIGATION RETURN WATER ON AQUATIC PLANTS (PERIPHYTON) IN THE SACRAMENTO RIVER AT KNIGHTS LANDING, CALIFORNIA,
California Univ., Davis. Dept. of Land, Air and Water Resources.
S. P. Hayes, A. W. Knight, D. E. Bayer, and G. R. Sanford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 322, Price codes: A05 in paper copy, A01 in microfiche. Technical Completion Report, Contribution No. 167, California Water Resources Center, University of California, Davis, February 1978. 75 p, 13 fig, 93 tab, 45 ref, 2 append.

Descriptors: *Irrigation water, *Return flow, Effects, *Aquatic plants, *Sacramento River(Cal), Summer, Seasonal, Measurement, Evaluation, Outfalls, Water quality, Abiotic factors, Biotic parameters, Statistical methods.

The characteristics of irrigation return water (IRW) from the Glenn-Colusa Irrigation District (GCID) and the impact of the IRW on the Sacramento River water (SWR) were studied through three summer irrigation seasons at stations above, in, and below the Colusa Drain at Knights Landing, California. The IRW in this outfall (IO) has significantly higher levels of all the abiotic factors measured (suspended matter, water turbidity, specific electrical conductance, major cation and major anion concentrations, water temperature, and hydrogen ion concentrations) than the SRW above the outfall (AO). The biotic parameters evaluated (densities of dominant diatoms, total diatom density, chlorophyll a, b, and c levels, and caloric content or organic matter levels) were obtained from periphyton communities harvested from glass substrates, and often had values significantly lower in IO and AO, with enhancement at stations below the outfall (BO). Stations were compared statistically using an analysis of variance followed by Duncan's multiple-range transformation of the data. The GCID IRW was found to differ significantly from the SRW and to have an impact on the SRW BO. (Graf-Cornell)
W79-00914

MAMMALIAN TOXICOLOGICAL EVALUATION OF WASTEWATERS RESULTING FROM THE MANUFACTURE OF PRIMERS,
Midwest Research Inst., Kansas City, MO.
H. V. Ellis, III, and D. O. Helton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 890, Price codes: A05 in paper copy, A01 in microfiche. Report to U.S. Army Medical Research and Development Command, Contract No. DAMD-17-75-C-5053, 88 p, October 1975. 5 fig, 6 tab, 21 ref.

Descriptors: *Toxicity, *Industrial wastes, *Chemical wastes, *Explosives, Chemical properties, Chemical analysis, Organic compounds, Animal physiology, Mortality, Chromatography, Waste water(Pollution), Lead, Bioassay, Water pollution effects, *Antimony, *Munitions, Munitions wastes.

Chemical characterization and animal toxicity studies on five desensitized primers, four wastewaters from primer production and one desensitization 'blank' were performed. High pressure liquid chromatography was most useful in characterizing the organic compounds present in the various samples. The original organic compounds were present in trace quantities of entirely absent from desensitized pure tetrazene, desensitized pure lead styphnate, desensitized pure trinitroresorcinol, tetrazene wastewater, primer mixture FA 956 wastewater, lead styphnate wastewater, and trinitroresorcinol wastewater. Desensitized tetrazene and desensitized primer mixture FA 956 were moderately toxic, with LD50's between 3 and 5 g solids/kg body weight in rats. Lot 3 of tetrazene wastewater was relatively toxic, with LD50's between 0.3 and 0.8 g/kg in rats and mice. The toxicity appears to be due to two characterized but unidentified organic compounds. The other samples were nontoxic in these animals. (EIS-Deal)
W79-00915

AQUATIC LIFE FIELD STUDIES AT BADGER ARMY AMMUNITION PLANT, (FINAL PHASE II REPORT, VOLUME 1),
Battelle Columbus Labs., Columbus, OH.
J. M. Stilwell, D. C. Cooper, M. A. Eischen, M. C. Matthews, and B. E. Sherwood.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 547, Price codes: A06 in paper copy, A01 in microfiche. Report to U.S. Army Medical Research and Development Command, DAMD 17-74-C-4123, 100 p, August 1976. 16 fig, 17 tab, 50 ref.

Descriptors: *Chemical wastes, *Toxicity, *Explosives, Water quality, Water analysis, Water chemistry, Bottom sediments, Benthic fauna, Periphyton, Industrial wastes, Organic compounds, Chemical properties, Water pollution effects, Chemical analysis, Phytoplankton, *Munitions, *Species diversity, *Nitrocellulose, *Nitroglycerin.

The objective of this study was to collect quantitative data describing the specific nature of effluent effects and the amount of primary munitions constituents in the effluents. Areas investigated included water quality, sediment chemistry, munitions constituent concentrations, periphyton community and the benthic macroinvertebrate community. In addition, the ecological responses to two primary munitions compounds, nitrocellulose and nitroglycerine, were examined. (EIS-Deal)
W79-00916

AQUATIC LIFE FIELD STUDIES AT JOLIET ARMY AMMUNITION PLANT, (FINAL PHASE II REPORT, VOLUME 1),
Battelle Columbus Labs., Columbus, OH.
J. M. Stilwell, D. C. Cooper, M. A. Eischen, M. C. Matthews, and B. E. Sherwood.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 548, Price codes: A07 in paper copy, A01 in microfiche. Report to U.S. Army Medical Research and Development Command, DAMD 17-74-C-4123, 130 p, August 1976. 28 fig, 44 tab, 45 ref.

Descriptors: *Explosives, *Chemical wastes, Industrial wastes, Chemical properties, Chemical analysis, Water quality, Water analysis, Effluents, Bottom sediments, Benthic fauna, Periphyton, Biological communities, Water pollution sources, Waste water(Pollution), *TNT, *Species diversity.

The objectives of this study were to collect quantitative data describing the specific nature of TNT manufacturing effluent effects on aquatic receiving systems and to determine the relationship between observed effects and the amount of munitions constituents in the effluents. Areas investigated included water quality, sediment chemistry, munitions constituent concentrations, the periphyton community and the macroinvertebrates community. Monitoring of TNT and two degradation products was conducted at sampling sites and plant outfalls. (EIS-Deal)
W79-00917

ACUTE TOXICITY OF RESIDUAL CHLORINE AND AMMONIA TO SOME NATIVE ILLINOIS FISHES,
Illinois State Water Survey, Urbana. Dept. of Registration and Education.
D. P. Roseboom, and D. L. Richey.
Illinois State Water Survey, Report of Investigation 85, 1977, ISWS/RI-85/77, 42 p. 10 fig, 13 tab, 61 ref, 5 append.

Descriptors: *Chlorine, *Ammonia, *Illinois, Freshwater fish, Bioassay, Toxicity, Mortality, Laboratory tests, Sunfish, Channel catfish, Bass, *Water quality standards, *Water pollution effects, Water temperature.

Ninety-six hour residual chlorine bioassays were conducted on bluegill and channel catfish. In 96-hour acute toxicity studies with ammonia (NH3-N) bass, in addition to blue-gill and channel catfish, were included. The studies were performed in waters typical of most lakes and streams in midwestern states, i.e., relatively high in alkalinity and the salts of calcium and magnesium. Observations regarding the characteristics and reaction of the fishes to each toxicant were noted. For residual chlorine the 96-hour TL50s ranged from 0.18 to 0.33 mg/l for bluegill, depending on temperature and fish weight. For channel catfish the TL50 was about 0.09 mg/l; temperature was not a factor. For ammonia the 96-hour TL50s for bluegill were dependent on temperature and fish weight and varied form 0.40 to 1.3 mg/l. Size was not a factor for bass and channel catfish. Ninety-six hour TL50s for these fishes ranged from 0.72mg/l at 22C to 1.2mg/l at 30C for bass and 1.5mg/l at 22C to 3.0mg/l at 28C for channel catfish. For the protection of the fishes investigated, and consistent with the water pollution regulations of Illinois, residual chlorine

in Illinois waters should not be detectable and NH3-N should not exceed a concentration of 0.04 mg/l. (EIS-Deal)
W79-00918

CRISIS SCIENCE: INVESTIGATIONS IN RESPONSE TO THE ARGO MERCHANT OIL SPILL,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
A. M. Pollack, and K. D. Stolzenbach.
Sea Grant Program Report No. MITSG-78-8, Index No. 78-308-Cmw, June 1978. 329 p, 42 fig, 3 tab, 90 ref, append. SG-04-7-158-44079.

Descriptors: *Oil spills, *Water pollution effects, Massachusetts, Oil pollution, Biological effects, *Argo Merchant oil spills.

The Argo Merchant oil spill on Nantucket Shoals (Massachusetts) in December 1976, was the focus of a massive scientific investigation. More than 200 scientists were involved in predicting and studying the fate and effects of the spill, at a cost exceeding $800,000. The report outlines three reasons scientists might want to take action following a spill and points out that previous post-spill activities have been somewhat less than successful in meeting these goals. The scientific work following the Argo Merchant spill is then reviewed as a case study of such post-spill science. The story of how the scientific response developed is told more or less chronologically and the scientific follow-up to the spill was not as good as it could have been. This was partly because of science's limited understanding of spills and limited ability to interpret data; but it was also partly because of logistical and institutional facotrs. The case is made that studying a spill is in many ways as demanding as trying to clean it up. A quick and efficient response is needed on extremely short notice to prevent valuable data from being lost and to provide scientific input into the cleanup effort in a timely manner. Some sort of research contingency plan is needed. This report concludes with some guidelines for formulation of such a plan. (NOAA)
W79-00929

TIDAL AFFECTED DISTRIBUTIONS OF SURFACE CHLOROPHYLL AND TRANSPARENCY IN THE NEW YORK BIGHT,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5B.
W79-00933

POLYCHLORINATED BIPHENYLS, CHLORINATED PESTICIDES AND TRACE METALS IN SOILS OF THE EVERGLADES NATIONAL PARK AND ADJACENT AGRICULTURAL ARE AS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 5B.
W79-00934

THE AMOCO CADIZ OIL SPILL. A PRELIMINARY SCIENTIFIC REPORT,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.; and Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W79-00935

IRON-ALGAE INTERACTIONS AS A FACTOR IN LAKE ERIE WATER QUALITY,
State Univ. of New York at Fredonia. Environmental Resources Center.
T. A. Storch.
Sea Grant Report. (1977), 25 p, 8 fig, 1 tab, 14 ref.

Descriptors: *Water quality, Algae, Photosynthesis, *Lake Erie, *Iron, *Phytoplankton, Phosphorus.

Nutrient enrichment analyses revealed that both chelated and unchelated iron affect the phytosynthetic rate of natural phytoplankton communities in eastern Lake Erie. Depending on the form, the concentration, and the time of year, iron additions may stimulate or inhibit algal photosynthesis. However, iron discharges from wastewater treatment plants using iron for phosphorus removal may not significantly affect algal growth in Lake Erie because of the high dilution effect. (NOAA)
W79-00936

PREFERENTIAL ELIMINATION OF DIELDRIN BY SOME DIATOMS COMPARED TO CHLAMYDOMONAS AND SCENEDESMUS SPECIES,
Marburg Univ. (Germany, F.R.). Fachbereich Biologie.
For primary bibliographic entry see Field 5B.
W79-00937

TOXICITY AND SUBLETHAL EFFECTS OF NO. 2 FUEL OIL ON THE SUPRALITTORAL ISOPOD LYGIA EXOTICA,
Texas A and M Univ., College Station. Dept. of Biology.
T. M. Dillon, J. M. Neff, and J. S. Warner.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 320-327, 1978. 1 fig, 2 tab, 15 ref.

Descriptors: Oil, *Oil spills, *Isopods, *Toxicity, *Respiration, Oil pollution, Fuels, Organic compounds, Animal behavio, Animal physiology, Animal metabolism, Mortality, Absorption, Water pollution effects, Tissue analysis, *Dibenzothiophenes, *Lygia.

No. 2 fuel oil was of relatively low toxicity to the intertidal isopod Lygia exotica. Respiration was not significantly affected by short-term exposure to several concentrations of No. 2 fuel oil prepared as either a water-soluble fraction or an oil-in-water dispersion. Lygia contaminated by a spill of No. 2 fuel oil and Bunker C residual oil contained high concentrations of dibenzothiophenes. It is not known whether the dibenzothiophenes were accumulated by the Lygia tissues or adsorbed to the exoskeleton. Therefore, the high mortality of Lygia following the spill cannot yet be attributed to the dibenzothiophenes. (EIS-Deal)
W79-00938

TOXICITY OF PERCHLOROETHYLENE, TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE AND METHYLENE CHLORIDE TO FATHEAD MINNOWS,
Dow Chemical Co., Midland, MI. Environmental Sciences Research Lab.
For primary bibliographic entry see Field 5A.
W79-00939

THE EFFECT OF LEAD ON OXYGEN UPTAKE IN THE CRAYFISH, ORCONECTES VIRILIS (HAGEN),
Northern Illinois Univ., De Kalb. Dept. of Biological Sciences.
R. V. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 394-400, 1978. 3 fig, 21 ref.

Descriptors: *Lead, *Crayfish, *Toxicity, Heavy metals, Air pollution effects, Animal physiology, Animal metabolism, Path of pollution, Oxygen requirements, Oxygen demand, Water chemistry, Water quality, Water analysis, Chemical analysis, Water pollution effects, Crustaceans, *Tissue analysis, *Bioaccumulation.

It was determined that increasing concentrations of lead will cause some decrease in the ability of O. virilis to take up oxygen. The crayfish was able to acclimate to the metal concentration by compensating for decreased gill efficiency through increasing its ventilation volume. Crayfish tend to take up lead primarily in the exoskeleton and gills. Concentration in these body parts increased as environmental concentration and time increased. (EIS-Deal)
W79-00941

FIELD VERIFICATION OF CADMIUM TOXICITY TO LABORATORY DAPHNIA POPULATIONS,
Argonne National Labs, IL. Radiological and Environmental Research Div.
J. S. Marshall.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 3, p 387-393, 1978. 1 fig, 3 tab, 5 ref.

Descriptors: *Cadmium, *Growth rates, *Toxicity, *Daphnia, Metals, Mortality, Population, Productivity, Reproduction, Epilimnion, Water chemistry, Chemical analysis, Water analysis, Regression analysis, Laboratory tests, Bioassay.

The purpose of this paper is to compare the short-term toxicity of cadmium to laboratory populations of D. galeata mendotes with that to natural populations of D. galeata mendotae and total Daphnia in Lake Michigan, as indicated by its effects on the populations' rates of increase. The relationship between the two populations' growth rates and cadmium concentrations was analyzed using regression analysis. While some differences between the two populations, they were observed, they were judged to not differ significantly in their sensitivity to cadmium.
W79-00942

A SUBLETHAL TECHNIQUE FOR ASSESSING THE EFFECTS OF CONTAMINANTS USING HYDRA LITTORALIS,
Institute for Marine Environmental Research, Plymouth (England).
A. R. D. Stebbing, and A. J. Pomroy.
Water Research, Vol. 12, p 631-635, 1978. 5 fig, 1 tab, 28 ref.

Descriptors: *Copper, *Toxicity, *Reproduction, Metals, Metabolism, Resistance, Growth rates, Adaptation, Cytological studies, Bioassay, Chemical analysis, Water quality, Water chemistry, Water analysis, Water pollution effects, *Hydra.

A technique is described for estimating the biological effects of low levels of contaminants using an index of response the rate of asexual reproduction of Hydra littoralis. Preliminary experiments show the rate of reproduction becomes significantly inhibited by levels of 2-12 micrograms Cu2+ l-1, although it appears that the rate oscillates for some days after the initial exposure to inhibitory agents. A control mechanism appears to regulate the rate of asexual reproduction and within the range of 0.5-2.5 microgram Cu2+ l-1 this mechanism enables the organism to counteract the inhibitory effect of copper, restoring growth to that of the controls after about 7 days. The concept of a quantifiable counter response is considered in a toxicological context. (EIS-Deal)
W79-00944

EFFECTS OF COPPER, PH AND HARDNESS ON THE CRITICAL SWIMMING PERFORMANCE OF RAINBOW TROUT (SALMO GAIRDNERI) RICHARDSON,
Guelph Univ. (Ontario). Dept. of Zoology.
K. G. Waiwood, and F. W. H. Beamish.
Water Research, Vol. 12, p 611-619, 1978. 5 fig, 3 tab, 70 ref.

Descriptors: *Copper, *Hydrogen ion concentration, *Hardness(Water), *Water chemistry, *Rainbow trout, Water analysis, Toxicity, Fish behavior, Metals, Heavy metals, Fish physiology, Animal metabolism, Water pollution effects, Mortality, Copper compounds.

Critical swimming velocities of Salmo gairdneri at 12C were determined in different combinations of copper, pH, and hardness. Measurements were made after exposure for 0.5, 5, 10, and 30 days. When copper was not applied, hardness, pH, and exposure time had no appreciable effect on critical performance. Copper had the greatest effect on swimming performance at 5 days of exposure. For any given hardness, copper had a greater effect on critical speed at low than at high pH. A given copper treatment had a more pronounced effect at low than at high hardness. Oxygen consumption of trout was determined in different combinations of copper and pH. In the presence of copper the maximum oxygen consumption decreased and the energy expenditure for a given swimming speed increased. The above observations are discussed in relation to reported toxic actions of copper. (EIS-Deal)
W79-00945

THE EFFECT OF PREHATCH AND POSTHATCH EXPOSURES TO CADMIUM ON SALINITY TOLERANCE OF LARVAL GRASS SHRIMP, PALAEMONETES PUGIO,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
D. P. Middaugh, and G. Floyd.
Estuaries, Vol. 1, No. 2, p 123-125, 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Cadmium, *Toxicity, *Salinity, *Shrimp, *Resistance, Metals, Growth rates, Embryonic growth stage, Larval growth stage, Mortality, Water pollution effects, Water temperature, Bioasay, *Survival.

Groups of embryonic grass shrimp, Palaemonetes pugio, were exposed to cadmium for the last 1, 4 or 8 days prior to hatching. Other groups of embryos were cultured in uncontaminated seawater. Prehatch exposure to cadmium was found to have no additive effect on the sensitivity of the larvae to cadmium exposure and salinity stress for 14 days after hatching. No significant decreases in survival were observed for any larvae transferred to 15 and 30 ppt salinity at a pre- and posthatch cadmium concentration of 0.1 mg/l. At a pre- and posthatch cadmium concentration of 0.3 mg/l, significant decreases in survival were observed for all of the larvae transferred to 10 and 15 ppt salinity after hatching. Significant decreases in survival were observed for only 2 of the groups exposed before hatching and transferred to 30 ppt salinity and 0.3 mg/l cadmium after hatching. (EIS-Deal)
W79-00947

AVIAN CHLOREA AND ORGANOCHLORINE RESIDUES IN AN AMERICAN OYSTERCATCHER,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5B.
W79-00948

EVALUATION OF AN AIR BUBBLER TO MITIGATE FISH IMPINGEMENT AT AN ELECTRIC GENERATING PLANT,
Texas Instruments Inc., Buchanan, NY.
For primary bibliographic entry see Field 5G.
W79-00950

UPTAKE, DISTRIBUTION, AND ELIMINATION OF THE LAMPRICIDE 2', 5-DICHLORO-4'-NITRO(14C) SALICYLANILIDE (BAYER 2353) AND ITS 2-AMINOETHANOL SALT (BAYER 73) BY LARGEMOUTH BASS,
Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5B.
W79-00951

ECOLOGICAL STUDIES OF FISHPONDS IN CHUPEI,
National Taiwan Univ., Taipei Dept. of Zoology.
Y. S. Lin.
Bulletin of the Institute of Zoology, Academia Sinica, Vol. 17, No. 1, p 43-59m 1976. 9 fig, 2 tab, 26 ref.

Descriptors: *Chlorophyll, *Carp, Productivity, Zooplankton, Nutrients, Hydrogen ion concentration, Seasonal, Phytoplankton, Ecology, Fertilizers, Fish management, Number fish per acre, Fish farming, Photosynthesis, Aquiculture, Fish ponds.

Ten fishponds were chosen from Chupei Fishery Institute to study the relationship among the amount of chlorophyll, zooplankton, gross production, and environmental factors. In July these ponds were stocked with fry of silver carp, common carp, grass carp, bighead, and crucian carp. Except two control ponds, the other eight ponds were treated with different fertilizers. From July through October, water samples were taken biweekly for the measurements of various variables. The seasonal variation of chlorophyll, gross production, zooplankton abundance, pH and water trasnparency were presented. All the variable studied showd no consistent seasonal pattern among the ten fishponds. The variations existed even between ponds with similar treatment. Whereas the variation of gross production, zooplankton abundance, pH and water transparency were all closely related to the amount of chlorophyll concentration. The mean coefficient of determination suggest that 70% of the variation of transparency in the fishponds could be explained by the chlorphyll concentration. However, the present study failed to show the close relationship of the production of various species of fish on the gross production, chlorophyll cncentration and zooplankton abundance.
W79-00952

POLYCHLORINATED BIPHENYLS IN THE BIOMASS OF THE BALTIC,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5B.
W79-00953

EXCHANGE OF HEAVY METALS IN ASCOPHYLLUM NODOSUM (L.) LE JOL. IN SITU BY MEANS OF TRANSPLANTING EXPERIMENTS,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
S. Myklestad, I. Eide, and S. Melsom.
Environmental Pollution, Vol. 16, p 277-284, 1978. 2 fig, 5 tab, 12 ref.

Descriptors: *Path of pollutants, *Heavy metals, *Marine algae, *Plant physiology, *Absorption, On-site investigations, Marine plants, Algae, Growth stages, Biochemistry, Copper, Lead, Cadmium, Mercury, Water pollution effects, Aquatic plants, Zinc, Bioindicators.

Plants of Ascophylum nodosum were tranferred from a locality with high concentrations of heavy metals in the sea water (Eikhamrane) to a locality with low concentrations (Flak). The alga grew for five months at the new locality. The zinc, lead, cadmium ad mercury contents in newly-grown tips were found to approach those in the tips of the the native plants in Flak. Inthe older parts of the plants the zinc and mercury contents decreased somewhat but remained high during the period investigated. The results are discussed in terms of current theories of heavy metal exchange in brown algae.
W79-00955

THE EFFECT OF FENITROTHION ON REPRODUCTION OF A TELEOST FISH, CYPRINUS CARPIO COMMUNIS LINN: A BIOCHEMICAL STUDY,
Punjab Agricultural Univ., Ludhiana (India). Dept of Zoology and Entomology.
K. Kapur, K. Kamaldeep, and H. S. Toor.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 438- 442, 1978. 1 tab, 11 ref.

Descriptors: *Fish reproduction, *Enzymes, *Biochemistry, *Pesticide toxicity, *Carp, Fish physiology, Animal metabolism, Pesticide residues, Pesticides, Toxicity, Animal pathology, Fish diseases, Path of pollutants, Water pollution effects, Growth stages, Inhibition, Inhibitors, Chemical properties, *Fenitrothion, Tissue analysis.

The level of 3 beta-HSD, along with that of various other steroid dehydrogenases is indicative of steroidogenesis in the gonadal tissue. It was demostrated that treatment with fenitrothion caused a great reduction in the activity of 3 beta-HSD in testicular and ovarian extracts fron carp. It was suggested that the action of fenitrothion on the gonads may be either by inhibition of the adenylcyclase enzyme or the inhibition of RNA and protein sysnthesis.
W79-00956

LACK OF EFFECT OF INGESTED FORTIES FIELD CRUDE OIL ON AVIAN GROWTH,
Aberdeen Univ. (Scotland). Dept. of Zoology.
M. L. Gorman, and C. E. Simms.
Marine Pollution Bulletin, Vol 9, p 273-276, 1978. 6 fig, 1 tab, 4 ref.

Descriptors: *Oil, *Growth rates, *Gulls, *Toxicity, Oil spills, Oil pollution, Water pollution effects, Animal physiology, Animal metabolism, Uptake, Amino acids, Proteins, Immature growth stages, Organic compounds, *Crude oil, *Tissue analysis, Kuwait crude, Louisiana crude.

The reported cessation of growth by young herring gulls dosed with Kuwait and Louisiana crude oil was not observed when chicks of herring gull and other birds were dosed with Forties crude oil from the North Sea. One reason for this discrepancy is thought to be that the former birds may already have completed their growth at the time of the experiments. (EIS-Deal) or development is recommended. This process advocates the full and effective use of the communication media to ensure that the plan would be developed and implemeted in consultation with all those affected. Second, the goals and objectives of the plan should be clearly stated and the means for implementing these measures should be delineated. The goals listed are the improvement of economic productivity; the overall improvement of environmetal quality through conservation; and the improvement of the quality of life of low income groups in waterfront areas. Third, the goals are operationalized and translated into specific policy recommendations for various functional areas of waterfront such as shellfish preservation, enlargement of parks and marinas, flood and storm damage control, water quality and others. An inventory of existing resources and uses in investigated in depth to provide a sound basis for the adoption of these plans.
W79-00957

A TOXICOLOGICAL EVALUATION OF A PLASTIC OIL ABSORBANT,
Tromso Univ. (Norway). Inst. of Biology and Geology.
S. Lonning, and B. E. Hagstrom.
Marine Pollution Bulletin, Vol. 9, p 276-278, 1978. 2 tab, 7 ref.

Descriptors: Oil, *Oil spills, *Dispersion, *Toxicity, Oil pollution, Organic compounds, Chemical analysis, Plastics, Animal physiology, Reproduction, Embryonic growth stage, Fish physiology, Larval growth stage, Copepods, *Crude oil, *Dispersants, *Sea urchin.

The effect of a plastic oil absorbant was tested on several different test organisms of different taxonomic positions. The results indicate that the Oil Killer under the experimental conditions described, acts as an almost inert nontoxic substance. The Oil effects were recorded. In combination with crude oil the Oil Killer seems to reduce the serious ill effects exerted by oil alone.
W79-00958

ACUTE TOXICITY OF COPPER TO A COPEPOD,
Athens Univ. (Greece). Zoological Lab. and Museum.
M. Moraitou-Apostolopoulou.
Marine Pollution Bulletin, Vol. 9, p 278-280, 1978. 1 fig, 1 tab, 20 ref.

Descriptors: *Copepods, *Toxicity, *Copper, *Adaptation, Bioassay, Industrial wastes, Domestic wastes, Metals, Resistance, Animal populations, Water pollution effects, Zooplankton, Genetics.

The acute toxicity of copper to the marine copepod Acartia clausi was determined by means of static bioassays. Natural copepod assemblages from two different locations, one from an area polluted with industrial effluents and domestic wastes and another from a relatively uncontaminated area, were compared. Results of metal toxicity tests expressed as 48 h LC50 values indicate a significant difference in the tolerance of copper between the two populations, with the LC50 of the pollution-adapted population higher than that of the population from the uncontaminated area. (EIS-Deal)
W79-00959

THE EFFECTS OF ARSENATE AND ARSENITE ON THE GROWTH AND MORPHOLOGY OF THE MARINE UNICELLULAR ALGAE TETRASELMIS CHUI (CHLOROPHYTA) AND HYMENOMONAS CARTERAE (CHRYSOPHYTA),
Texas A and M Univ., College Station. Dept. of Biology.
N. R. Bottino.
Journal of Experimental Marine Biology and Ecology, Vol. 33, p 153-168, 1978. 13 fig, 12 ref.

Descriptors: *Phytoplankton, *Arsenic compounds, Toxicity, Growth rates, Cytological studies, Absorption, Metabolism, Membrane processes, Salinity, Resistance, Algae, Radioactivity, Techniques, Tracers, *Arsenate, *Arsenite, Mutagens.

The marine phytoplankton algae, Tetraselmis chui and Hymenomonas carterae, were grown in media containing various concentrations of arsenate or arsenite. The effects of arsenic on the algae varied with the oxidation state of the element, its concentration, and the degree of illumination. Arsenate affected mainly algal growth but also cell morphology, whereas arsenite caused only morphological changes. Studies on the incorporation of 74As-arsenate into cells grown in artificial sea water indicated that arsenate was incorporated and later partially released by both T. chui and H. carterae. Both arsenate influx and efflux seemed to be energy-dependent phenomena, because they varied with the degree of illumination. Differences between the rates of uptake and release of arsenic suggested that arsenate undergoes chemical changes after having been transported into the algal cells. (EIS-Deal)
W79-00960

DOUNREAY OIL SPILL: MAJOR IMPLICATIONS OF A MINOR INCIDENT,
Leeds Univ. (England). Wellcome Marine Lab.
R. S. Bowman.
Marine Pollution Bulletin, Vol. 9, p 269-273, 1978. 2 fig, 11 ref.

Descriptors: *Oil, *Oil spills, *Oil pollution, *Shores, Water pollution sources, Organic compounds, Baseline studies, Beaches, Dispersion, Birds, Water pollution effects, Mortality, Toxicity, Tides, *Dispersants.

Few reports of oil spills on an exposed rocky shore have taken into account the background of natural events and the period over which the possible consequences of pollution and its treatment may come to light. This small incident has served as a cautionary tale, illustrating the pitfalls of instant assessment, and the type of baseline experience required for biological interpretation. It has also underlined the continuing inadequacy of the ecological advice available when treatment decisions have to be made. (EIS-Deal)
W79-00961

TOLERANCE TO LEAD IN THE FRESHWATER ISOPOD ASELLUS AQUATICUS,
Nottingham Univ. (England). Dept. of Genetics.
J. Fraser, D. T. Parkin, and E. Verspoor.
Water Research, Vol. 12, p 637-641, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Lead, *Adaptation, *Resistance, *Isopods, Crustaceans, Absorption, Genetics, Size, Toxicity, Heavy metals, Water pollution effects, Path of pollutants, Mortality, Animal physiology, Animal metabolism, Enzymes, Animal populations, Evolution, *Asellus.

Samples of the freshwater crustaceans Asellus aquaticus were taken from three sites in the River Trent basin, subjected to different amounts of lead pollution. The survival rate of large and small animals were compared experimentally in a series of different concentrations of lead. Differential survival was recorded between the size classes and the sites that could be explained in terms of genetic adaptation. The significance of the results is discussed in terms of adaptation to environmental pollution. (EIS-Deal)
W79-00962

INDIVIDUAL AND COMBINED TOXICITY OF SOME PETROLEUM AROMATICS TO THE MARINE AMPHIPOD ELASMOPUS PECTENICRUS,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
W. Y. Lee, and J. A. C. Nicol.
Marine Biology, Vol. 48, p 215-222, 1978. 1 fig., 6 tab., 28 ref.

Descriptors: *Toxicity, *Aromatic compounds, Oil, *Amphipoda, Fuels, Organic compounds, Mortality, Animal physiology, Animal metabolism, Bioassay, Water pollution effects, Chemical properties.

Toxicity of 4 compounds of petroleum oilsto the marine amphipod Elasmopus pectenicrus has been assessed. Two ephemeral aromatic hydrocarbons, naphtahalene (A) and 1,2,4-trimethylbenzene (B) were more toxic than two persistent aromatics, o-cresol (C) and 0-toluidine (D). The acute toxicity concentrations obtained for individual aromatic compounds were always greater than the actual concentrations found in the water-soluble fractions (WSF) of fuel oils. Results from mixtures of2 or more components indicated that the LC50 levels were primarily determined by the more toxic substances, A and B. Naphthalene and 1,2,4-trimethylbenzene became more toxic to the E. pectenicrus when present in a mixture of more than 2 components, and the toxicity increased with increasing numbers of components present. Synergistic effects, therefore, possibly occur in the whole WSF. No antagonistic effects were observed among the 4 petroleum aromatics.
W79-00963

THE EFFECTS OF DEPRESSED PH ON SPERMATOGENESIS IN FLAGFISH JORDANELLA FLORIDAE,
Sir George Williams Univ., Montreal (Quebec). Dept. of Biological Sciences.
S. M. Ruby, J. Aczel, and G. R. Craig.
Water Research, Vol. 12, p 621-626, 1978. 6 fig, 4 tab, 15 ref.

Descriptors: *Hydrogen ion concentration, *Fish reproduction, *Water chemistry, Cytological studies, Toxicity, Fish physiology, Animal metabolism, Fish eggs, Fish populations, Water quality, Industrial wastes, Air pollution effects, *Flagfish, *Jordanella, Tissue analysis, *Spermatogenesis.

Mature male flagfish Jordanella floridae were continuously exposed to lake water with depressed pH levels of 6.0, 5.5, 5.0, and 4.5 during a 20 day period at 25C. Quantitative histological analysis based upon the final stage of spermatogenesis prior to sperm formation indicated that the production of mature sperm was reduced at all pH values tested by 24.03, 27.03, 37.28 and 35.29% respectively when compared with the control at pH 6.7. Total volume of reproductive tissue relative to somatic tissue within the testes showed similar declines compared to the control. The general decline in spermatogenesis was confirmed morphologically by increased occurrence of tubules devoid of sperm and was particularly evident at pH 4.5. Comparison of the present results with data from female ovaries of the same experiment suggests a higher sensitivity of developing eggs to declining pH when compared with developing sperm. (EIS-Deal)
W79-00964

ASPECTS OF THE ECOLOGY OF PRYMNESIUM PARVUM (HAPTOPHYTA) AND WATER CHEMISTRY IN THE NORFOLK BROADS, ENGLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
P. A. Holdway, R. A. Watson, and B. Moss.
Freshwater Biology, Vol. 8, p. 295-311, 1978. 9 fig, 2 tab, 48 ref.

Descriptors: *Phytoplankton, *Fish diseases, *Water chemistry, *Salinity, *Eutrophication, Fishkill, Mortality, Toxicity, Fish physiology, Water quality, Water analysis, Cytological studies, Nitrates, Phosphorus, Nutrients, Chlorophyll, Seasonal, *Prymnesium, River Thurne, Norfolk Broads (England).

Prymnesium parvum, an ichthyotoxic phytoplankter, has been recorded, at times abundantly, in the River Thurne, Norfolk, and its associated Broads. Its occurrence has been apparently more frequent and its polpulation sizes probably larger since the late 1960s than previously and fish mortalities due to it now occur almost annually. The Thurne system is brackish and may have become more so in recent years, exploitation by drainage pumps of a saline water table. Evidence for this is conflicting, but in any case an increase in salinity is unlikely to have made increased Prymnesium growth more likely. Eutrophication of some Broads in the system is most likely to have increased the populations of Prymnesium since the late 1960s. Data are presented on the present water chemistry of the system for comparison with previous records, and on current phytoplankton and Prymnesium crops in different parts of it. EIS-Katz)
W79-00965

CHRONIC SUBLETHAL EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2

FUEL OILS ON THE MARINE ISOPOD, SPHAEROMA QUADRIDENTATUM,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
W. Y. Lee.
Marine Environmental Research Vol. 1, p 5-17, 1978. 4 tab., 25 ref.

Descriptors: *Toxicity, *Oil, *Fuels, *Isopods, Oil pollution, Oil spills, Organic compounds, Reproduction, Fecundity, Growth rates, Mortality, Aquatic population, Water pollution effects, Chemical properties, Juvenile growth stage, Animal physiology, Animal metabolism, *Water-soluble fractions, *Sublethal effects, Chronic effects.

Two series of experiments were carried out to assess the long-term effects of the water soluble fractions (WSF) of Fuel oils on the marine isopod, Sphaeroma quadridentatum. In one experiment, juvenile isopods (one month old) were exposed to sublethal concentrations of a fuel oil room temperatures of 24 plus or minus 1.6 C for nine months. These isopods survived to maturity and reproduced. However, growth rate was adversely affected at concentration greater than or equal to 3% WSF and fecundity was depressed at concentrations grater than or equal to 1% WSF. Survival of offspring in clean seawater was dependent to a large extent on the history of the previous generation. In another experiment, adult Sphaeroma (three months old) were subjected to the WSFs of four fuels oils for one month. Fecundity was depressed at a concentration greater than 15% WSF, regardless of the kind of fuel oil. On the other hand, the number of young produced by the surviving females varied with the type of fuel oil for the same level of WSF. This may be attributed to different relative amounts of toxic components present in the WSF. (EIS-Deal)
W79-00966

PETROLEUM HYDROCARBON RESISTANCE IN THE MARINE WORM NEANTHES ARENACEODENTATA (POLYCHAETA: ANNELIDA), INDUCED BY CHRONIC EXPOSURE TO NO. 2 FUEL OIL,
Texas A and M Univ., College Station. Dept. of Biology.
S. S. Rossi, and J. W. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 513-521, 1978. 2 fig, 2 tab, 20 ref.

Descriptors: Oil, *Fuels, *Annelids, *Resistance, *Oil pollution, Oil spills, Organic compound, Toxicity, Larval growth stage, Juvenile growth stage, Bioassay, Genetics, Animal metabolism, Animal physiology, Membrane processes, Radioactivity techniques, Tracers, Carbon radioisotopes, *Polychaetes, *Crude oil, Water-soluble fraction, *Neanthes, *Naphthalenes.

Three successive generations of the marine polychaetous annelid Neanthes arenaceodentata taken from a laboratory population, were continuously exposed to one of three sub-lethal concentrations of No. 2 fuel oil water-soluble-fractions (WSFs). During each generation larvae, juvenile, and immature adult polychaetes were challenged with acute (96 h) doses of No. 2 Fuel Oil or south Louisiana crude oil WSF to test their sensitivity to petroleum hydrocarbons (PHCs). Larvae from all 3 generations, at all exposure concentrations, were no different from control (susceptible) larvae in their sensitivity to the two test oils. F1, F2, and F3 adults exhibited equally increased PHC resistance (x2) compared to control adults. The only evidence of increased resistance beyond that observed in F1 animals, was seen in results of bioassays with juvenile worms, wherein PHC resistance increased from slightly below control levels in F1 juveniles to slightly above control tolerance among F3 juveniles. (EIS-Deal)
W79-00967

SALINITY AND TEMPERATURE TOLERANCE BY NYMPHON GRACILE (LEACH) AND ACHELIA ECHINATA (HODGE) (PYCNOGONIDA),
University Coll. of Swansea (Wales). Dept.of Zoology.
A. S. N. El-Hawawi, and P. E. King.
Journal of Experimental Marine Biology and Ecology, Vol. 33, p 213-221, 1978. 8 fig, 12 ref.

Descriptors: *Salinity, *Water temperature, Resistance, Humidity, Littoral, Animal physiology, Animal Metabolism, Toxicity, Mortality, Seasonal, Habitats, Salt tolerance, *Pycnogonid, *Nymphon, *Achelia.

The tolerance of two species of pycnogonid, Achelia echinata and Nymphon gracile to a range of salinities, temperatures, and relative humidities has been examined. In most instances, No. gracile is more resistant than A. echinata and indeed is found higher in the littoral zone during the warmer summer months and thus likely to be subjected to greater environmental fluctuation. (EIS-Deal)
W79-00968

INFLUENCE OF DOMESTIC WASTES ON ENERGETIC PATHWAYS IN ROCKY INTERTIDAL COMMUNITIES,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
M. M. Littler, and S. N. Murray.
Journal of Applied Ecology, Vol. 15, p 583-595, 1978. 2 fig, 3 tab, 15 ref.

Descriptors: *Productivity, *Energy, *Intertidal area, *Growth rates, *Reproduction, *Nutrients, Biological communities, Domestic wastes, Sewage effluents, Cyanophyta, Bacteria, Aquatic habitat, Trophic level, Water pollution effects, Omnivores, Herbivores, Crustaceans, Mollusks, *Suspension feeders, *Tissue analysis.

The calorific contents of eighteen macroinvertebrates and thirty-six macrophytes were determined in an unpolluted rocky intertidal habitat and in a nearby polluted habitat. Much of the variation in the calorific values of macrophytes was related to life span. The algae that characterized the unpolluted community usually contained comparatively fewer calories per unit weight. These forms had relatively more structural tissues and hence allocated relatively less energy to rapid growth and reproduction. In the polluted habitat, fugitive or opportunistic algal species were more prevalent; these had more rapid growth rates and higher productivites and tended to have relatively high calorific contents. In nearly every case, macroinvertebrates populations exposed to domestic sewage had higher energy contents than did corresponding populations from the unpolluted habitat. Macroinvertebrates in the polluted habitat grazed greater proportions of blue-green algae and bacteria. Omnivores and suspension feeders in the polluted habitat appeared to utilize energy-rich compounds in the sewage effluent; this may explain the greater standing stocks of ominvores and suspension feeders in the peripheral regions of the outfall plume. (EIS-Deal)
W79-00969

METAL ACCUMULATION AND DEPURATION BY THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
For primary bibliographic entry see Field 5B.
W79-00970

A REVIEW OF THE BIOLOGY OF BRITISH NAIDIDAE (OLIGOCHAETA) WITH EMPHASIS ON THE LOTIC ENVIRONMENT,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
M. A. Learner, G. Lochhead, and B. D. Hughes.
Freshwater Biology, Vol. 8, p 357-375, 1978. 1 fig, 2 tab, 116 ref.

Descriptors: *Oligochaetes, *Lotic environment, Reproduction, Periphyton, Bioindicators, Food habits, Benthic fauna, Habitats, Bacteria, Aquatic habitats, Niches, Aquatic life, Aquatic populations, Animal behavior, *Bibliographies, *Reviews, *Naidids.

Naidids live in a wide range of aquatic habitats but are particularly important numerically as part of the benthic fauna of rivers with stony substrates. Major factors determining the distribution and abundance of naidid species are the nature of the substratum and the presence and kind of vegetation. Plants with a highly dissected form, a thick growth habit, and which permit the greatest periphyton development generally support the most abundant naidid populations. Naidids reproduce both asexually and sexually, the former method predominating for most of the year. In general, naidids are most abundant during the summer months when rates of growth and asexual reproduction are stimulated by higher temperatures and a plentiful supply of food. The response of naidid species to different kinds of pollution is varied but generally organic enrichment of rivers which have stony substrates results in a considerable (ten- to twenty-fold) increase in anidid abundance. The importance of Naidiae in relation to pollution surveillance of freshwater is discussed. (EIS-Deal)
W79-00971

ACUTE TOXICITY OF BROMOCHLORINATED SEAWATER TO SELECTED ESTUARINE ESTUARINE SPECIES WITH A COMPARISON TO CHLORINATED SEAWATER TOXICITY,
Virginia Inst. of Marine Sciences, Gloucester Point.
M. H. Roberts, Jr., and R. A. Gleeson.
Marine Environmental Research, Vol. 1, p 19-29, 1978. 3 fig, 1 tab, 23 ref.

Descriptors: *Sea water, *Toxicity, *Chlorination, *Bromine, Chlorine, Estuaries, Mortality, Oysters, Copepods, Lethal limit, Disinfection, Larval growth stage, Juvenile growth stage, Resistance, Atlantic menhaden, Hcemical properties, Ammonia, Chemical degradation, Animal physiology, Fish physiology, *Menidia, Crassostrea, Leiostomus, Palaemonetes, *Bromochlorinated seawater.

The acute toxicity of bromochlorinated estuarine water was determined for several estuarine organisms. The most sensitive species were oysters (Crassostrea virginica) (larvae and juveniles) and copepods (Arcatia tonsa) with 48-h LC50's of 0.10 to 0.21 mg/BrCl/liter. Palaemonetes pugio was most tolerant with a 96-h LC50 of 0.70 mg BrCl/liter. The fish species tested (Menidia menidia, Brevoortia tyrannus and Leiostomus xanthurus) all had a 96-h LC50 of 0.21-0.23 mg BrCl/liter. The BrCl toxicity data are compared with Cl2 toxicity data for the same species. When the LC50's are expressed as equivalents per liter, BrCl is found to be two to four times less toxic than Cl2. The ranking of species in terms of sensitivity is the same for both disinfectants. (EIS-Deal)
W79-00972

EFFECTS OF AERATION IN EARTHEN PONDS ON WATER QUALITY AND PRODUCTION OF WHITE CATFISH,
South Carolina Agricultural Experiment Station, Clemson.
H. A. Loyacano.
Aquaculture. 3(3), p 261-271, 1974.

Descriptors: Dissolved oxygen, Chemical oxygen demand, Air pollution effects, *Aeration, *Catfish, Food, Earthen ponds, Fish production, Water pollution effects, *White catfish.

Comparing effects of air volumes of 0, 6.9 and 10.4 m3/min/ha (0,100 and 150 ft3/min/acre) indicated that greater volumes of air resulted in increased fish production. Increased volumes of air resulted in proportionate increases in dissolved O2 content, allowing greater weights of food to be offered to fish without depleting the O2 content of the pond water. Chemical oxygen demand was inversely related to the volume of air delivered.--Copyright 1975, Biological Abstracts, Inc.
W79-00973

TOXICITY OF COPPER TO THREE ESTUARINE BIVALVES,
Centre of Advanced Study in Marine Biology Porot Novo (India).
A. K. Kumaraguru, and K. Ramamoorthi.
Marine Environmental Research, Vol 1, p 43-48, 1978. 3 tab, 12 ref.

Descriptors: *Copper, *Toxicity, Commercial shellfish, Bioassay, Animal physiology, Animal metabolism, Metals, Mortality, Resistance, Animal behavior, Water pollution effects, Lethal limit, *Static bioassay.

This paper reports on a study of the toxicity of copper to three species of bivalve of commercial food value, Anadara granosa, Meretrix casta, and Crassostrea madrasensis. The LC50 values were estimated as 60 microg Cu/liter for A. granosa, 72 microg Cu/liter, for M. casta, and 88 microg Cu/liter for C. madrasensis subjected to 96-h static bioassay tests after acclimation for a period of four days in the laboratory. The revival rates of bivalves which survived exposure to the LC50 concentrations for the 96-h period (when marked and released in the natural environment) were 67% for A. granosa, and C. madrasensis and 83% for M. casta. The LT50 values for the three bivalves at different concentrations of the metal were also calculated. (EIS-Deal)
W79-00974

ACUTE AND SUBLETHAL TOXICITY OF NAPHTHALENE AND THREE METHYLATED DERIVATIVES TO THE ESTUARINE COPEPOD, EURYTEMORA AFFINIS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
F. S. Ott, R. P. Harris, and S. C. M. O'Hara.
Marine Environmental Research, Vol 1, p 49-58, 1978. 1 fig, 3 tab, 14 ref.

Descriptors: *Copepods, *Estuaries, *Toxicity, Organic compounds, Chemical properties, Mortality, Animal physiology, Animal metabolism, Reproduction, Fertility, Fecundity, Water pollution effects, Aromatic compounds, Growth stages, *Naphthalenes, Eurytemora, Methyl naphthalenes.

The bi-cyclic aromatic hydrocarbon naphthalene and its alkylated derivatives 2-methylnaphthalene, 2,6-dimethylnaphthalene, and 2,3,5-trimethylnaphthalene were used to investigate possible relationships between increased methylation and toxicity during acute high level and chronic low level exposure experiments using the calanoid copepod Eurytemora affinis. The 24-h LC50 levels indicated an approximate twofold increase in toxicity per methyl group addition. Low levels chronic exposure of E. affinis to the various naphthalenes in sea water concentrations of about 10 microg/liter for the duration of their adult life (maximum twenty-nine days) resulted in significant reductions in length of life, total numbers of nauplii produced and mean brood size. Exposure to all the naphthalenes at this level (approximately 10 microg/liter) resulted in reduced rates of egg production which were, on average, about 50% of those in control animals. Results are discussed in relation to previous work on the fate and effect of petroleum hydrocarbons in marine copepods. (EIS-Deal)
W79-00975

ENRICHMENT OF ESTUARINE PHYTOPLANKTON BY THE ADDITION OF DISSOLVED MANGANESE,
North Carolina Univ. at Chapel Hill. Marine Science Program.
J. G. Sanders.
Marine Environmental Research, Vol 1, p 59-66, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Manganese, *Phytoplankton, *Nutrients, *Sewage effluents, *Dissolved oxygen, Estuaries, Effluents, Sewage disposal, Tidal effects, Absorption, Productivity, Water pollution effects, Growth rates, Biochemical oxygen demand, Algae, *Complexation.

The response of natural phytoplankton to additions of excess Mn in an estuary receiving sewage effluents varied with tidal amplitude. During periods of low tidal amplitude, when DOC concentrations were high, carbon uptake by phytoplankton was stimulated. When tidal amplitudes were relatively high, carbon uptake was not affected by Mn addition. The link between high DOC concentrations and stimulation suggests that the Mn addition either relieves a deficiency in available Mn caused by organic complexation or complexes organics from the sewage effluent which are otherwise harmful to phytoplankton productivity. Sewage effluent entering estuaries can be both beneficial and detrimental to the phytoplankton population. Productivity is increased by the addition of inorganic nutrients but may be depressed by the organics contained in the effluent. (EIS-Deal)
W79-00976

ACCUMULATION OF HEAVY METALS IN RAINBOW TROUT SALMO GAIRDNERI (RICHARDSON) MAINTAINED ON A DIET CONTAINING ACTIVATED SEWAGE SLUDGE,
University Coll., Cardiff (Wales). Dept. of Zoology.
S. M. Singh, and P. N. Ferns.
Journal of Fish Biology, Vol 13, p 277-286, 1978. 2 fig, 6 tab, 25 ref.

Descriptors: *Heavy metals, *Rainbow trout, *Absorption, *Sewage sludge, *Activated sludge, *Fish diets, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Cadmium, Mercury, Metals, Laboratory tests, Aquiculture, Bioaccumulation.

Rainbow trout were fed for 10 weeks with a nutritionally balanced diet containing 30% by weight of activated sewage sludge. The whole body concentrations of nine heavy metals (Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd, Pb), together with four major cations (Ca, Mg, Na, K) were determined at the beginning and end of the experiment and at three intermediate stages. Fish fed on the diet containing sewage sludge had significantly elevated levels of Cr, Fe, Ni, Pb and reduced levels of Na and K compared with controls, though the values obtained for all groups fell within the range reported for uncontaminated fish. The Ni and Zn showed a marked increase towards the end of the experiment, suggesting that they might have continued to rise after 70 days. (EIS-Katz)
W79-00977

EVALUATION OF TOXICITY OF SOME INDUSTRIAL WASTES TO FISH BY BIOASSAY,
Shri Govindram Seksaria Technological Inst., Indore (India). School of Studies in Botany.
For primary bibliographic entry see Field 5B.
W79-00978

MERCURY AND THE ESTUARINE MARSH CLAM, RANGIA CUNEATA GRAY. II. UPTAKE, TISSUE DISTRIBUTION, AND DEPURATION,
Texas A and M Univ., College Station. Dept. of Biology.
T. M. Dillon, and J. M. Neff.
Marine Environmental Research, Vol 1, p 67-77, 1978. 5 fig, 1 tab, 35 ref.

Descriptors: *Mercury, *Clams, Animal physiology, Animal metabolism, Path of pollutants, Heavy metals, Salinity, Estuaries, Absorption, Chemical reactions, Commercial shellfish, Tissue analysis, Bioaccumulation, *Depuration, Rangia, Marsh clam.

During a two-week period, Rangia rapidly accumulates mercury (as mercuric chloride) from dilute solution (0.03-0.05 ppm) with the majority being located in gill and mantle tissue. Initial depuration (5 h) in clean seawater is rapid in all tissues. From 10-192 h concentrations of mercury in gill, foot and adductor muscles remain stable while mantle, haemolymph, and viscera levels continue to fluctuate in a manner suggesting internal redistribution of mercury. After eight days of depuration, the viscera contains the most mercury and appears to be the only tissue to increase its proportionate share of the total tissue mercury. After fifteen weeks of depuration, residual mercury in whole clams is about 20% of initial concentrations. Acute decreases in salinity enhance Rangia's ability to depurate mercury. (EIS-Deal)
W79-00979

A KEROSENE-LIKE TAINT IN THE SEA MULLET MUGIL CEPHALUS (LINNEAUS) II. SOME ASPECTS OF THE DEPOSITION AND METABOLISM OF HYDROCARBONS IN MUSCLE TISSUE,
Queensland Dept. of Primary Industries, Hamilton (Australia).
D. W. Connell.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 492-498, 1978. 3 fig, 4 ref.

Descriptors: Fish physiology, *Mullets, *Absorption, *Lipids, Path of pollutants, Animal metabolism, Organic compounds, Food webs, Chemical properties, Chemical analysis, Gas chromatography, Aromatic compounds, Biodegradation, Taste, Commercial fish, *Tissue analysis, *Alkanes.

The results obtained indicate that the deposition of absorbed hydrocarbons in different segments of the muscle tissue of the sea mullet is proportional to the lipid content of the segment. However, the results give no clear indication as to whether the total lipid content of the muscle tissue of individual fish influences the uptake of hydrocarbons for the environment. Evidence has been presented for different rates of metabolism of the n-alkanes as compared to the iso-alkanes and related compounds. Metabolic processes in the sea mullet result in the preferential degradation of the n-alkanes leaving a hydrocarbon mixture in the sea mullet enriched with iso-alkanes and related compounds. (See also W74-11312) (EIS-Deal)
W79-00980

SUBSTITUTE CHEMICAL PROGRAM. INITIAL SCIENTIFIC REVIEW OF MSMA/DSMA,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W79-00982

TAMANO OIL SPILL IN CASCO BAY: ENVIRONMENTAL EFFECTS AND CLEANUP OPERATIONS.
Environmental Protection Agency. Washington, DC. Spill Prevention and Control Board.
For primary bibliographic entry see Field 5G.
W79-00983

ELEOCHARIS ACICULARIS (L) R AND S: THE AUTECOLOGY OF AN ACID TOLERANT SEDGE,
Pennsylvania State Univ., University Park. Dept. of Biology.

P. E. Rothrock, and R. H. Wagner.
Castanea, Vol. 40, No. 4, p 279-289, December, 1975. 4 fig, 2 tab, 16 ref.

Descriptors: *Rooted aquatic plants, *Ecological distribution, Wetlands, *Acid polluted waters, *Eleocharis, Streams, Hydrogen ion concentration, Phosphorus, Carbon dioxide, Aquatic plants.

The sedge Eleocharis acicularis (L) R and S is a mat forming species found in acid polluted waters with pH as low as 2.85. Both terrestrial and submergent forms are known and were shown by reciprocal transplants to be genetically identical and freely interconvertible. The colonies tend to be in backwash areas where water current is mostly negligible and substrate texture is clay-silt. Mats buried under silt are capable of reestablishing themselves by internodal elongation in association with the production of new culms. Measurements of the chemical environment varied widely but phosphorus and CO2 levels were thought to be of possible importance. Reproduction is most often accomplished by asexual fragmentation but seeds, when produced, have a germination rate as high as 86%. (Stihler-Mass)
W79-00984

THE FRESH-WATER POLYCHAETE, MANAYUNKIA SPECIOSA, IN A THERMAL CHANNEL, CLEVELAND HARBOR LAKE ERIE.
Cleveland State Univ., OH. Dept. of Biology.
R. G. Rolan.
Am Midl Nat. 92(1), p 207-213, 1974.

Descriptors: *Lake Erie, Channels, Chlorination, Cleveland, Harbors, Lakes, Light, Manayunkia-speciosa, Ohio, Oxygen, *Polychaetes, Sediment, *Thermal pollution, Water pollution, Hydrogen ion concentration, *Worms.

Six specimens of the fresh-water polychaete, Manayunkia speciosa, wre collected in the Cleveland Harbor Ohio, area of Lake Erie in Sept. and Oct., 1970. Four were found in the inlet channel of the Cleveland Electric illuminating Company's Lakeshore power plant. Two were found in the discharge channel. This is the 1st known occurrence of this unusual worm in a thermal discharge area. Physical data included bottom temperature, dissolved O2, pH, light intensity, and sediment particle size distribution and organic content. Bottom temperatures in the discharge channel averaged 6C higher than in the inlet. Dissolved O2 was never lower than 5 ppm. Sediment in the inlet was predominantly very fine sand with a mean organic content of 8.65% while in the discharge channel the sediment was composed mostly of very fine sand, fine gravel and rocks. Its mean organic content was 7.18%. These data and information from other reports suggest that Manayunkia speciosa had broad tolerance limits for many of the factors commonly measured, such as temperature, dissolved O2, substrate texture and current velocity. It is also apparently able to withstand high levels of chlorination. Its apparent broad tolerance limits and high passive vagility contrast with its restricted distribution.--Copyright 1974, Biological Abstracts, Inc.
W79-00985

A NOTE ON THE EFFECT OF LOWERED TEMPERATURES ON THE SURVIVAL OF EGGS AND FRY OF THE GRASS CARP CTENOPHARYNGODON IDELLA (VALENCIENNES),
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
B. Stott, and D. G. Cross.
J Fish Biol. 5(6), p 649-658, 1973.

Descriptors: Austria, *Carp, Ctenopharyngodon-idella, Effluents, *Eggs, Fry, Grass, Lowered temperature, Powerplants, Seasonal, Spawning, *Survival, *Temperatures, United-Kingdom.

The grass carp has been introduced into many countries and yet self-sustaining populations are known at only 4 sites outside its natural range. While the hydrological conditions apparently necessary for spawning are unlikely to occur in the United Kingdom, the requirements of temperature and perhaps water speed occur locally in heated effluents from power stations. Since most heated effluents tend to layer on the water surface, grass carp eggs laid in effluents would quickly be exposed to falls in temperature of up to about 9C. Experiments carried out in Austria with newly fertilized eggs show that incubation temperatures below 20C result in large scale deaths and deformities which lead to death, although 20 h old fry are not adversely affected. Because summer river temperatures seldom exceed 20C, if spawning did occur it would be unsuccessful at most power station sites. At sites where the power station uses a considerable proportion of the available river flow and where the effluent mixes completely downstream, eggs could possibly survive if temperature were the major criterion for successful development.--Copyright 1974, Biological Abstracts, Inc.
W79-00986

FLOWS OF MATERIALS BETWEEN POORLY FLOODED TIDAL MARSHES AND ESTUARY,
Maryland Univ. Solomons, Chesapeake Biological Lab.
D. R. Heinle, and D. A. Flemer.
Marine Biology, Vol. 35, No. 4, p 359-373, April 30, 1976. 7 fig, 5 tab, 40 ref.

Descriptors: *Tidal marshes, *Cycling nutrients, Nutrients, Flooding, Detritus, Standing crops, Estuaries, Salt marshes, Patuxent estuary.

Flows of particulate carbon, nitrogen, phosphorus, chlorophyll a, crude fiber, carbohydrate, and adenosine tri-phosphate; and of dissolved nitrogen and phosphorus between a marsh and the patuxent estuary, Maryland, were measured over a 2-year period. Virtually no carbon was exchanged, while net flows of nitrogen and phosphorus were from the marsh to the estuary, principally in dissolved forms. Data suggest that fluxes of detritus from stable marshes subjected to modest amounts of tidal flooding are slight, amounting to less than 1% of the maximum areal standing crops.(Maroncelli-Mass)
W79-00987

CONTRIBUTION OF NUTRIENTS FROM SEDIMENTS AND INTERSTITIAL WATER TO COLVILLE RIVER SYSTEM, ALASKA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 2K.
W79-00989

IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenigs.
Limnology and Oceanographic, Vol 21, No 5, p 674-683, Sept. 1975. 3 fig, 3 tab, 23 ref.

Descriptors: *Bogs, *Iron, *Chemical stratification, Wetlands, Michigan, Anaerobic conditions, Chemical reactions, Water properties, *Acid bog lakes, Ferrous organic complexes, Inorganic iron, North Gate(Michigan).

Inorganic, nonreactive spcies of iron FE (OH) 3, represent minor amounts of the total iron in North Gate lake, in contrast to lakes of pH 6-8. In situ radiochemical analyses revealed that colloidal reactive ferric iron predominates in the oxygenated epilimnion, while dialyzable or dissolved ferrous iron increases with depth. Unlike iron, organic matter is present in a nontransient colloidal state. in acid bog lakes, pH 4-5, ferric iron may be collaoidal not as an inorganic complex (OH(-)) but as reactive Fe (3+) by complexation with the colloidal organic acids. After thermally induced mixing with anaerobic waters, ferric iron is reduced and dissolved; however, some reactive iron remains colloidal, suggesting the presence of a residual ferrous iron complex. (Steiner-Mass)
W79-00990

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME I.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W79-00998

5D. Waste Treatment Processes

A PROCESS AND PILOT PLANT DESIGN STUDY OF THE ABSORPTION FREEZING VAPOR COMPRESSION PROCESS.
Concentration Specialists, Inc., Andover, MA.
For primary bibliographic entry see Field 3A.
W79-00507

EVALUATION OF ULTRAVIOLET/OZONE TREATMENT OF ROCKY MOUNTAIN ARSENAL (RMA) GROUNDWATER (TREATABILITY STUDY),
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. E. Buhts, P. G. Malone, and D. W. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 339, Price codes: A03 in paper copy, A01 in microfiche. Technical Report Y-78-1, January 1978. 38 p, 12 tab, 6 ref, append.

Descriptors: *Chemical wastes, *Water pollution treatment, *Groundwater, *Ultraviolet radiation, *Ozone, Wastes, Colorado, Waste water treatment, *Rocky Mountain Arsenal(Colo), Waste disposal.

Rocky Mountain Arsenal (RMA) has been a chemical manufacturing and chemical demilitarization facility since 1942. Wastes from various chemical processes were discharged into unlined basins until construction of an asphalt-lined evaporation lake in 1955. Repeated contact of rainwater and groundwater with chemical wastes in and beneath the basins has resulted in transport of chemical compounds toward the boundaries of RMA. The groundwater at RMA is known to be contaminated with chlorinated hydrocarbons, organophosphorous, organosulfur, and other organic compounds. This investigation examined the use of ultraviolet/ozone (UV/O3) treatment to reduce the concentration of contaminants in RMA groundwater. Experimental results obtained from treating RMA groundwater with UV light and ozone are given. Two different batch reactors were used, and such parameters as ozone concentration, temperature, and wattage of UV light were varied. Continuous flow experiments were also conducted. In batch experiments, total organic carbon removal ranged from 40 to 90 percent. The concentrations of diisopropylmethylphosphonate (DIMP) and other organic compounds were significantly reduced. In the continuous flow phase of the study, it was possible to remove 93 percent of the DIMP originally present and lower the levels of all other organic contaminants to below detectable limits. (WES)
W79-00538

DEGRADATION OF UREA BY BACTERIA AND ALGAE IN MASS ALGAL CULTURES,
Warsaw Univ. (Poland), Dept. of Environmental Microbiology.
R. J. Chrost, J. Owczarek, and K. Mtusiak.

Acta Microbiologica Polonica, Vol. 7, No. 4, 1975, p 231r236. 4 tab, 14 ref.

Descriptors: *Urea, *Urease, *Bacteria, *Waste water treatment, *Chlorella vulgaris, *Degradation(Decomposition), Algae, Industrial wastes, Fertilizers, Nutrient removal, Beneficial use, Enzymes, Tertiary treatment, Metabolites, Hydrolysis, Biological treatment.

An investigation in which the alga Chlorella vulgaris and accompanying bacteria was used to study the role of urease in urea hydrolysis in nitrogen fertilizer plant wastewater showed no presence of the enzyme in this strain of the alga, but did however demonstrate the importance of urease-containing bacteria in urea removal. Relatively high urea assimilation during initial states of the algal culture appears due to bacterial participation. Urea-hydrolyzing bacteria were subsequently eliminated from the algal culture by algal metabolites, resulting in diminished urea uptake from treated wastes. No changes in pH of the growth medium were observed. No urease activity was found in either intact or sonicated C. vulgaris cells. It can be assumed that this alga strain degrades urea by a process other than hydrolysis. Chemical analyses showed an increase in ammonia with time in the algal culture. Unicellular algae are useful in fertilizer industry wastewater treatment because of their short generation time, small sensitivity to pH changes, and high ability to remove nitrogen loads. In these tests C. vulgaris was maintained in a continuous culture on wastewater containing 1169 mg N/liter as urea. Bacterial composition was observed to change from domination by gram-positive bacteria to domination by gram-negative bacteria. (Lynch-Wisconsin)
W79-00573

ANTIVIRAL SUBSTANCES FROM CALIFORNIA MARINE ALGAE,
California Univ., Berkeley. Naval Biosciences Lab.
For primary bibliographic entry see Field 3C.
W79-00590

DRAFT ENVIRONMENTAL IMPACT STATEMENT, NORTH FULTON COUNTY AND NORTHEAST COBB COUNTY, GEORGIA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W79-00653

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA.
Denver Regional Council of Governments, CO.
For primary bibliographic entry see Field 5G.
W79-00656

PLANNING AND INSTITUTIONAL CONSIDERATIONS IN WASTEWATER TREATMENT FACILITIES PLANNING, BOSTON, MASSACHUSETTS. PHASE 1 STUDY,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
C. Binkley, J. Hudson, and R. Tabors.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 576, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Council on Environmental Quality, Washington, D.C. Final Report. July 16, 1976, 149 p, 47 tab. EQ6AD451.

Descriptors: *Waste water treatment, *Waste water treatment facilities, Water pollution, *Water quality standards, *Water supply, *Water quality, *Planning, Air quality, Water supply, Recreation, Transportation, Costs, Environmental effects, Land use, *Boston(MA), Municipal debt, *Federal Water Pollution Control Act Amendments, Data collection, Coastal zone management, Population projections.

This report covers Phase 1 of a comprehensive case study of the effectiveness of planning for municipal wastewater treatment facilities construction grants under the FWPCA Amendments of 1972. It presents baseline data and an investigation of relevant issues for analyzing the problems of administering a national wastewater treatment program. The study area, around Boston, MA, lies south of the northern extension of BOSWASH conurbation which extends from Norfolk, VA to Lowell, MA. The first part of the report covers the institutional setting for wastewater management in the study area, consisting of state agencies, regional sewer agencies, the Metropolitan Area Planning Council, and the relevant planning bodies in cities and towns. Definitions of the study area are offered with the implications each definition has for wastewater management. Definition by political boundary, sewered areas, or by river basins all offer special problems when assessing the best method for wastewater management. The existing and proposed facilities are discussed but data limitations restricted the scope of the analysis. Existing land use patterns and population projections for the study area are offered and it is noted that two major regional wastewater studies project significantly different figures for population growth and dispersement. The report stresses the need for consistency and for placing the facility construction plans ahead of areawide wastewater management plans. The final chapter discusses the problems of financing necessary water pollution abatement expenditures. The appendices list data sources, bibliography, records of interviews and a glossary of acronyms used. (Coan-NC)
W79-00667

FACILITIES PLAN ADMINISTRATIVE REPORT FOR LEAD-DEADWOOD, SANITARY DISTRICT NO. 1, DEADWOOD, SOUTH DAKOTA.
CH2M Hill, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 134, Price codes: A15 in paper copy, A01 in microfiche. May 1976. 328 p, 10 fig, 7 tab.

Descriptors: *South Dakota, *Pollution abatement, *Water quality, Sewage treatment, Cities, Constraints, Environment, Facilities, Waste water treatment, Surveys, Project planning, *Lead(SD), *Deadwood(SD).

The plan study consisted of 4 parts: an administrative report presenting the selected waste water management system, with background, alternatives, and basic issues; a technical report for environmental assessment, documenting the steps and decisions evolved; the environmental assessment of the proposed project; and detailed background materials with task reports developed during the planning procedure, supporting the issues and conclusions. A distinction was made between water quality objectives, standards or criteria, and limitations. (Froehlich-ISWS)
W79-00707

PURIFICATION OF AQUEOUS WASTE FROM INITIAL TREATMENT OF WOOL - BY ALLOWING WASTE TO SETTLE, TREATING WITH POLYELECTROLYTES, AND REINTRODUCING SEPARATED DEPOSIT BEFORE FINAL SEPARATION PROCESS.
Soviet Patent SU-558-870. Issued December 12, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 32, p 6, September, 1978.

Descriptors: *Patents, *Textile wastes, *Oily water, *Flocculation, *Industrial wastes, Separation techniques, Sedimentation rates, Waste water treatment.

A patent has been granted for a method to treat waste water from the initial stages of wool processing. The process involves settling, treatment with a mixture of polyelectrolytes, and further settling for 24 hrs to separate wool grease and dirt residues. The process is improved by reintroducing the residue into the purified water at a volumetric ratio of 1:1-1.5, stirring the mixture for 2-2.5 hrs, and allowing the mixture to settle again. When the process was applied to 20 liters of separated residue added to an equal volume of purified water, wool fat removal increased from 80 to 93.6% and sulphonal removal from 63 to 78.4%. (Schulz-FIRL)
W79-00727

TREATMENT OF DYEING EFFLUENTS - BY OXYGENATION, ELECTROLYSIS FLOCCULATION, SEPARATION AND FILTRATION, TO YIELD A SOLVENT SUITABLE FOR FURTHER DYEING.
French Patent FR 2368-567. Issued June 23, 1978. Derwent French Patents Abstracts, Vol. A, No. 29, p 4, August, 1978.

Descriptors: *Recycling, *Patents, *Dyes, *Textiles, *Water reuse, *Electrolysis, Flocculation, Industrial wastes, Chemical wastes, Effluents, Waste water treatment, Oxygenation, Separation techniques.

A patent has been issued for an aqueous dyebath solvent formed from effluents of previous dyeing processes. The solvent improves dye quality, reduces wastage, and allows for textile dyeing in a closed circuit to alleviate effluent disposal problems. After oxygenation, effluent collected from previous dyeing is passed to an electrolysis vat where an electric current is fed to a soluble metal anode. This forms a flocculent metal hydroxide which adsorbs impurities from effluent. A decantation filter is used to separate the flocs from the aqueous solvent before replenishment with fresh dyes. (Schulz-FIRL)
W79-00728

PROPYLAMMONIUM HALIDE STARCH DERIVATIVES - USED AS FLOCCULANTS, AND IN TEXTILE AND PAPER INDUSTRIES.
German Patent DS-2055-046. Issued August 3, 1978. Derwent German Patents Abstracts, Vol. A, No. 32, p 2, September, 1978.

Descriptors: *Flocculation, *Chemical reactions, *Pulp and paper industry, *Patents, *Textile wastes, Separation techniques, Industrial wastes, Waste water treatment, Organic compounds.

A patent has been issued for a process to prepare propylammonium halide starch derivatives to be used as flocculating agents in waste water treatment for the textile finishing and paper processing industries. The cation active derivatives are prepared by reaction of starch with quarternary 3-halogeno-2-hydroxypropylammonium halides or the corresponding epoxides in an alkaline medium. The reaction is especially conducted with tertiary amines containing alkyl, alkenyl, aryl or aralkyl groups and halogenohydrins; this is followed by treatment with hydrogen halides and optional conversion to the epoxides. (Schulz-FIRL)
W79-00729

REMOVING FLUORIDE FROM WASTE WATER BY ADDING CALCIUM AND PHOSPHATE - AND PRECIPITATING GERMS OF FLUOR:APATITE OR CALCIUM FLUORIDE.
Netherlands Patent NL-7800-830. Issued July 26, 1978. Derwent Netherlands Patents Report, Vol. A, No. 32, p 4, September, 1978.

Descriptors: *Patents, *Fluorides, *Chemical precipitation, *Chemical wastes, *Industrial wastes, Separation techniques, Waste water treatment, Calcium.

A patent has been granted for a continuous treatement process for waste water from the manufacture of phosphates, fluoroborates, fluoride, fluorine, and fluorosilicates. A calcium compound is added to the waste water stream to provide a molar ratio of calcium to fluoride of at least 5.0. A phosphate compound is added concurrently to maintain a pH of 6.0-11.5. Fluoroapatite and/or calcium fluoride are added as precipitating agents which act to crystallize the fluoride from the continuous stream of waste water. The process is reported to yield residual fluoride concentrations of less than 0.1 ppm, a value considerably lower than the 4.0 to more than 10 ppm obtained by conventional methods. (Schulz-FIRL)
W79-00731

A REVIEW OF CURRENT INTEREST AND RESEARCH IN WATER HYACINTH-BASED WASTEWATER TREATMENT,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5G.
W79-00786

INSTALLATION FOR THE MECHANICAL-BIOLOGICAL PURIFICATION OF WASTE WATER,
Mecafina SA, Schmerikon (Switzerland). (Assignee).
E. Fuchs.
U.S. Patent No. 4,090,965, 13 p, 15 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 4, p 1424-1425, May 23, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water purification, Water pollution treatment, *Biological treatment, Filtration, Equipment.

An installation for the mechanical-biological purification of waste water or sewage incorporates at least one biological stage and one post-clarification stage, the post-clarification stage incorporating a filter. The filter is a drum filter having a filter surface at the inflow or deposit side of it. A suction nozzle extends transversely with respect to the direction of relative movement between the filter surface and the suction nozzle. (Sinha-OEIS)
W79-00825

WASTE WATER PURIFICATION SYSTEM,
The Redux Corp., St. Louis, MO. (Assignee).
T. N. Deane.
U.S. Patent No. 4,092,242, 6 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1855, May 30, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Detergents, Water reuse, Emulsifiers, Flocculation, Separation techniques.

Waste water containing synthetic detergents (syndets) such as water soluble sulfonates or ethoxylated alcohols is reclaimed for re-use by emulsifying with a water insoluble, high molecular weight, anionic surface active oil, then breaking the emulsion by conventional physical or chemical methods, thereby producing a coherent floc which occludes the syndet and all insoluble matter suspended in the water, then separating the floc from the purified water in a coherent mass. (Sinha-OEIS)
W79-00831

SEWAGE TREATMENT DEVICE,
Commanche Engineering Corp., Rockwell City, IA. (Assignee).
D. La Gatta.
U.S. Patent No. 4,092,249, 6 p, 7 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1859, May 30, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Aerobic treatment, Aerobic conditions, Oxygen, Mixing, Septic tanks.

A septic tank is described which permits aerobic breakdown of the sewage, but which does not utilize an air compressor. Instead, the invention utilizes a three compartment tank which permits the sewage to move progressively from a first, to a second, to a third compartment, and which provides for recirculation of the fluid back from the third compartment into the second compartment. When recirculated, the fluid is sprayed into the second compartment which has a vented air chamber above the fluid level. By spraying the fluid into this second compartment, the invention permits the exposure of the fluid to oxygen and causes agitation of the fluid within the second compartment. The sprays are directed in such a manner so as to create a circular agitation motion thereby maintaining many of the solid materials in suspension within the fluid. This permits a more thorough and complete breakdown of the fluids. (Sinha-OEIS)
W79-00833

PROCESS FOR RECOVERING CHEMICALS FROM THE WASTE LIQOURS OF SULFATE CELLULOSE DIGESTION AND THE WASTE WATERS OF BLEACHING,
Ahlstrom (A.) Osakeyhtio, Helsinki (Finland).
K. O. Henricson.
U.S. Patent No. 4,093,508, 6 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 264, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Bleaching wastes, Separation techniques, Industrial water, Water reuse, Cellulose, *Chemicals recovery.

The invention relates to a process for the recovery and reuse of sodium and sulfur chemicals in connection with sulfate cellulose production, whereby the chlorine chemicals are simultaneously removed from the liquor system in the form of sodium chloride. It is possible to use the waste water flow from the bleaching apparatus either entirely or partially for washing the digestion chemicals from cellulose. Besides, the waste flow can be used for dissolving the melt coming from the soda-ash roaster. Or the waste water coming from the bleaching apparatus can be used instead of condensation water and clean water at several other stages of the recovery system for digestion chemicals. In the recovery system a melt from a soda-ash roaster, mainly containing sodium sulfide and sodium carbonate, but also sodium chloride is dissolved and clarified to produce a green liquor containing carbonate sulfide and chlorides. The carbonate is separated from the sulfide and the chlorides then at least part of the sodium chloride is separated from the sulfide in solution, at least part of the carbonate is causticized into hydroxide, and the hydroxide and sulfide in solutions are mixed together in a ratio suitable to form a digestion solution with the desired sulfide content. (Sinha-OEIS)
W79-00837

PREPARATION OF LIQUID FUEL AND NUTRIENTS FROM MUNICIPAL WASTE WATER,
J. L. Lang.
U.S. Patent No. 4,093,516, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 266, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Organic wastes, Fermentation, Separation techniques, Fuels, Ultimate disposal.

An ultimate disposal method for municipal waste, i.e. sewage, to produce useful products comprises the combined steps of separation, either simultaneously or consecutively with a chosen concentration step, of the solid components of the municipal waste, followed by microbial conversion of the soluble contaminants. It is followed by conversion of the separated solid components to a fermentable mixture, fermentation, and separation of the end products of the fermentation to produce a valuable nutrient fraction and a valuable fuel fraction, usable, e.g. as fuel for an internal combustion engine, and purified water. (Sinha-OEIS)
W79-00838

ACTIVATED SLUDGE TREATMENT OF WASTEWATER,
Autotrol Corp., Milwaukee, WI. (Assignee).
C. F. Guarino.
U.S. Patent No. 4,093,539, 7 p, 3 fig, 5 ref; Official Gazette of the United Stages Patent Office, Vol 971, No 1, p 274, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Biological treatment, Activated sludge, Aeration, Equipment.

A method for operating an activated sludge wastewater treatment plant utilizes rotating contactors that are partially submerged in the wastewater in the aeration tank of the activated sludge plant. The rotating contactors provide a fixed film media for the growth of biological life that is present in the recycled activated sludge. The result is a more active biological coating on the fixed film media than is found on such media when used as a separate secondary treatment. In the preferred embodiment, the energy to rotate the contactors is supplied by the same compressed gas that is normally introduced below the surface of the wastewater in the aeration tank of the conventional activated sludge system. (Sinha-OEIS)
W79-00839

METHOD OF THE REMOVAL OF METALLIC MERCURY,
Tecneco, S.p.A., Fano (Italy). (Assignee).
C. Piccinini, and V. Conti.
U.S. Patent No. 4,093,541, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 274, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution treatment, *Mercury recovery, Separation techniques, Activated carbon.

A method is disclosed for removing metallic mercury from industrial sewage waters. The improvement is that the polluted liquors are treated with activated carbon having a high specific surface. (Sinha-OEIS)
W79-00840

METHOD AND APPARATUS FOR AMMONIA-NITROGEN REMOVAL BY VACUUM DESORPTION,
Sterling Drug, Inc., New York. (Assignee).
D. S. Ross.
U.S. Patent No. 5,094,544, 20 p, 15 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 274-275, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water quality control, Nitrogen compounds, Ammonia, Gases, Hydrogen ion concentration, Equipment, Vacuum desorption.

The requirements for treating wastewater have steadily increased. One of the requirements which is becoming more important is the elimination of nitrogen from wastewater effluent after the effluent has been processed for removing other polluting constituents. This invention is adapted to operate in many difficult types of processes containing objectionable quantities of ammonia-

nitrogen. Ammonia-nitrogen is present in wastewater as both ammonium ions and ammonia gas. The apparatus and method includes the concept of increasing the pH of the wastewater to a highly basic condition, exposing the wastewater to a vacuum having an absolute pressure at least approaching the vapor pressure of the wastewater proportional to the given temperature whereby ammonia gas is then desorbed from the wastewater, and subsequently absorbing the desorbed ammonia in a body of liquid having a pH substantially less than the highly basic condition of the original wastewater. (Sinha-OEIS)
W79-00841

AERATOR SEWAGE TANK,
H. L. Wilson.
U.S. Patent No. 4,093,549, 7 p, 9 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 276-277, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Domestic wastes, Aeration, Aerobic conditions, Equipment.

A sewage treatment tank comprises an aeration compartment and a clarifying compartment separated by a vertical baffle-like wall having a steeply inclined lower portion which provides a hopper-like bottom in the clarifier compartment. A submerged pump is provided in the aeration compartment having an outlet discharging into the aeration compartment with specially devised aspirating means for drawing air through the outlet to mix with the raw sewage. It provides a high velocity air fluid stream for aerobic treatment. A separate curved baffle at the bottom of the vertical baffle imparts a circular roll-like stream to the aerating stream and by close spacing to the tank bottom provides a narrow throat-like passage to the clarifier compartment which facilitates drawing any heavy solids back to the aerating compartment for further treatment. A specially devised skimmer to skim solids from the clarifier compartment is provided at the discharge side of the pump. (Sinha-OEIS)
W79-00842

DEVICE FOR PURIFYING SEWER WATER IN SMALL SEWER SYSTEMS,
IFO A. B., Bromolla (Sweden). (Assignee).
U. Paabo, and E. H. Albertsen.
U.S. Patent No. 4,093,551, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 1, p 277, June 6, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Domestic wastes, Water pollution treatment, Chemicals, Sedimentation, Equipment, Siphons.

A device purifies sewer water in a small sewer water system by chemical cleaning of the water which takes place by means of the addition of a liquid containing chemical substances which promote the sedimentation of contaminates in the water. The supply of such a liquid takes place from a receptacle via a tube operating according to the siphon principle. The object of this invention is to provide a purifying device which does not comprise any movable parts but nevertheless automatically controls the supply of the chemical treatment liquid in response to the supply of sewer water. (Sinha-OEIS)
W79-00843

WATER PURIFICATION METHOD,
Westinghouse Electric Corp., Gateway Center, PA. (Assignee).
K. Moeglich.
U.S. Patent No. 4,094,755, 13 p, 14 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 683, June 13, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Industrial wastes, Domestic wastes, Suspended solids, Electrolysis, Electrodes, Electric fields, Electric currents, Turbulence, Equipment.

A variety of waste waters are treated by an improved method and apparatus for continuously agglomerating solids of colloidal size or larger suspended in a liquid. The process comprises passing the liquid between spaced electrode plates in the presence of a fluidized bed of conductive particles, and subjecting the liquid suspension to an electric field from alternating current applied across the electrodes through the conductive particles of the bed. The turbulence of the particles has been found to improve conductivity and current efficiency, minimize electrode erosion, and by a mechanical, scrubbing action of the bed particles, minimize fouling or scaling of the electrodes so that the suspending forces of the solids are rapidly and efficiently broken. THe agglomerated solids may then be separated from the liquid by conventional means such as skimming, settling, flotation and the like. (Sinha-OEIS)
W79-00847

METHOD FOR TREATMENT OF OIL-CONTAINING WASTE WATER BY USING AN OIL ADSORBENT,
Koa Oil Co. Ltd., Tokyo (Japan). (Assignee).
K. Noguchi, K. Yoshimura, H. Tanaka, and M. Hayashi.
U.S. Patent No. 4,094,776, 9 p, 1 fig, 7 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 689, June 13, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Oil pollution, Industrial wastes, *Separation techniques, *Adsorption.

An oil adsorbent excellent in the capacity of adsorbing and collecting oils contained in waste waters and capable of being regenerated with ease to restore its activity after it has been used is described. A process for the preparation of the oil adsorbent and a method for treating oil-containing waste waters is also described. A pitch-like substance formed by heat treatment of a heavy hydrocarbon oil, especially one having a volatile matter content of about 10% by weight to about 60% by weight, has a very high oil-adsorbing capacity and after it has been used, the high adsorbing capacity can easily be restored by a simple regenerating method. This pitch-like substance shows an effective oil-adsorbing action when used in the powdery or granular form. (Sinha-OEIS)
W79-00850

PROCESS FOR THE LIQUID PHASE OXIDATION OF ORGANIC SUBSTANCE-CONTAINING EFFLUENTS,
Mitsui Toatsu Chemicals Inc., Tokyo (Japan). (Assignee).
Y. Iwai, M. Okabe, N. Seki, A. Hiai, and S. Iguchi.
U.S. Patent No. 4,094,780, 11 p 3 fig, 4 tab, 10 ref; Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 690-691, June 13, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water purification, Oxidation, Catalysts, Chemical reactions, Separation techniques, Liquid phase oxidation, Copper catalist, Recovery.

A process for the liquid phase oxidation of an organic substance-containing effluent comprises subjecting the effluent to a liquid phase oxidation treatment in the presence of a copper catalyst at a coppper ion concentration of 50-5000 ppm and also in the presence of an ammonium ion concentration of five or more times the copper ion concentration to oxidize the organic substances in the effluent. The copper catalyst is recovered from the treated effluent for reuse. The recovery of the copper catalyst may be effected either by a process in which the copper catalyst is separated as a precipitate or by a process using a resin adsorption. (Sinha-OEIS)
W79-00853

FEASIBILITY OF RAINWATER COLLECTION SYSTEMS IN CALIFORNIA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 3B.
W79-00855

INTERFERENCES IN TRACE CONTAMINANT REMOVAL BY ADSORPTION FROM WATER FOR GROUNDWATER RECHARGE,
California Univ., Davis. Dept. of Civil Engineering.
K. McBride.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 386, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, December 1977. 71 p, 16 fig, 7 tab, 22 ref, 2 append. (California Water Resources Center Project UCAL-WRC-W-510).

Descriptors: *Waste water treatment, *Groundwater recharge, *Phenols, Adsorption, Trace elements, Organic wastes, *Activated carbon, Effluents.

The central problem of this study is whether the advanced treatment of a waste stream containing phenolic compounds is feasible for the purpose of recharging to the groundwater. Removal of trace refractory organics requires use of a physicochemical method. Activated carbon adsorption is a suitable process choice because low level removals of most organic materials can be obtained, the process is inexpensive in comparison to other advanced treatment processes such as reverse osmosis and because considerable field experience has been gained. The project involves the adsorption of a domestic secondary effluent with a known addition of phenol onto activated carbon. Phenol was chosen as a specific contaminant because of its common abundance and it's very low level discharge requirements. Phenolic compounds may be found in the wastewaters derived from almost any oil, petro-chemical or pesticide related activity. These include oil refineries, wood and coal distillations and the manufacture of plastic and chemical products. (Synder-Calif, Davis)
W79-00858

A METHOD OF USING IRRIGATION DRAINAGE WATER FOR POWER PLANT COOLING,
California Univ., Berkeley. Sea Water Conversion Lab.
H. H. Sephton, and G. Klein.
Executive Summary Report, Section A: Process and Pilot Plant Design; Section B: Reduction of Scaling Potential in High-Calcium, High Sulfate Waters. Sept. 1977. (California Water Resources Center Desalination Project) 40 p.

Descriptors: *Irrigation water, *Water reuse, *Salinity, Wastewater, Ion exchange, Powerplants, Engineering structures, Cooling water, *Water softening, Feed water, Ion-exchange resins, Vertical tube foam evaporation.

The accumulation of large quantities of saline water collected from irrigated fields by underground drainage systems presents environmental problems in the South-Western U.S. and Mexico. Research and development projects suggested the technical and economic feasibility for using such wastewaters for power plant cooling, using a novel process sequence comprising (1) ion-exchange resin softening whereby nearly all the hardness is removed, followed by (2) using this softened water as feed to the power plant cooling tower, concentrating it by a factor of 5 to 15; this

cooling tower blowdown is subsequently (3) further concentrated by vertical tube foam evaporation (VTFE) to provide a 20-fold concentrate of the initially softened wastewater which is then adequate to (4) serve as the sole regenerant for the ion-exchange resin used in the initial softening step. Step (4) is carried out in an upflow fluidized bed mode which ensures favorable reaction kinetics by the formation and removal of calcium sulphate precipitate from the resin bed. (Snyder-Calif, Davis)
W79-00862

TESTS OF COAGULANTS FOR THE REDUCTION OF VIRUSES, TURBIDITY, AND CHEMICAL OXYGEN DEMAND,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W79-00868

VIRUS REMOVAL BY CHEMICAL COAGULATION,
For primary bibliographic entry see Field 5F.
W79-00869

UNIVERSITY OF CALIFORNIA SALINE WATER CONVERSION RESEARCH.
California Univ., Berkeley. Sea Water Conversion Lab., and California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W79-00875

EFFECTS OF BROMINE CHLORIDE ON SEVERAL UNICELLULAR GREEN ALGAL SPECIES UNDER LABORATORY CONDITIONS,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
R. W. Randle.
Project Completion Report, April 1978, 40 p, 5 fig, 8 tab, 14 ref, 1 append. OWRT A-072-ILL(1).

Descriptors: *Waste water treatment, *Disinfection, *Chlorination, *Bromine, *Bromine chloride(BrCl), *Chlorophyta, *Algicides, Algal control, Water purification, Sewage treatment, Algae bioassay, Analytical techniques, Water quality control, Water pollution treatment.

The algicidal and algistatic effects of bromine chloride (BrCl) on various species of unicellular green algae were investigated under laboratory conditions using algal bioassay techniques. Concentrations of BrCl was applied as concentration levels likely to be found in field conditions where waste water disinfection is practiced: 0 mg/l (control), 0.20 mg/l, 0.50 mg/l, and 1.0 mg/l. Under the experimental conditions employed and for the species tested, BrCl appears to be an efficient algicidal agent in concentrations of 0.2 to 1.0 mg/l. In this concentration range, as halogen concentration increases, the number of viable algal cells decreases. Recommendations for further study include: (1) definition of the action time needed at particular concentrations; (2) concentration spikes or continuous chemical addition to maintain constant concentration; (3) lower chemical concentrations; (4) variations in response to other temperatures, such as 5 C, 20 C, and 35 C; (5) use of different test species, including Selenastrum capricornutum and Cossmarium spp. (thought to be chlorine resistant and bromine sensitive); (6) photoreactivity tests in light and dark growth conditions; (7) effects of combined residual halogen found in natural waterways; and (8) definition of metabolic modes of action of halogens on various algal species. (Majtenyi-IPA)
W79-00882

REMOVAL OF WOOD-DERIVED TOXICS FROM PULPING AND BLEACHING WASTES,
Institute of Paper Chemistry, Appleton, Wisconsin.
D. B. Easty, L. G. Borchardt, and B. A. Wabers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 785, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-78-031, 89 p, February, 1978. 19 fig, 14 ref, 23 tab. R-803525-04.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxins, *Bleaching wastes, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Sulfite liquors, Pulp and paper industry, Aerated lagoons, Biological treatment, Biochemical oxygen demand, Activated sludge, Chemical precipitation, Lime, Reverse osmosis, Membrane processes, Membranes, Toxicity, Tertiary treatment, Aluminum, Sulfates, Fatty acids, Resin acids, Ultrafiltration, Guaiacols, Stearic acid, Kraft mills, Sulfite pulp mills.

Wood-derived compounds known to possess toxicity toward fish and to be present in pulp mill effluents include resin and unsaturated fatty acids, their chlorinated analogs, chlorinated guaiacols, and epoxystearic acid. Studies at the Institute of Paper Chemistry (Appleton, Wisconsin) were carried out to assess the extent to which these compounds are removed from pulp mill effluents by different waste treatment systems in use in several locations in the U.S.A. Effluents before and after treatment were analyzed. Nearly all of the waste treatment processes studied removed the toxic compounds effectively. Although primary clarification had little effect on these materials, aerated lagoons and air-activated sludge systems normally removed from 80 to 100% of the resin and fatty acids and their chlorinated analogs from kraft and sulfite mill effluents. Biological treatment facilities which exhibited poorer fatty and resin acid removal were those which received high loadings of fatty and resin acids and BOD. High loadings were apparently reflected also in the lower percentage removal of the toxic compounds in the two oxygen-activated sludge systems studied. Large reductions in concentrations of the toxicants were observed following precipitation processes (lime precipitation and tertiary treatments employing alum). Reverse osmosis demonstrated essentially complete rejection of fatty and resin acids. Performance of pilot ultrafiltration units was either good or marginal, apparently depending upon the type of membrane used. Although chloroform contents of the samples were affected minimally by ultrafiltration, they underwent reductions of from 88 to 98% in all of the other treatment systems studied. (Witt-IPC)
W79-00905

ANALYTICAL REPORT NEW ORLEANS AREA WATER SUPPLY STUDY.
Environmental Protection Agency, Dallas, TX. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W79-00981

WASTEWATER MANAGEMENT ALTERNATIVES FOR THE SHELLFISH PROCESSING INDUSTRY,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00995

5E. Ultimate Disposal Of Wastes

TECHNICAL AND REGULATORY STATUS OF THE PLACEMENT OF SANITARY LANDFILLS IN IOWA,
Iowa State Univ., Ames.
L. V. A. Sendlein, and J. Kipp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 337, Price codes: A05 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report ISWRRI-87, September 1977. 87 p, 17 fig, 19 tab, 19 ref. OWRT A-065-IA(1).

Descriptors: *Landfills, *Iowa, *Groundwater, *Surveys, *Data collections, *Hydrologic data, *Monitoring, Drainage, Sinks, Flood plains, Leachates, Topography, River basins, Geology, Water resources, Groundwater geology, Hydrogeology, Water pollution, Water pollution sources, Soil contamination, Disposal, Evaluations.

Landfill placement in Iowa was summarized and the effects of landfill placement for three upland Iowa sites were monitored and discussed. Information on landfills was obtained by inspecting all permits and was used to tabulate and analyze landfill sites in Iowa relative to topographic position, monitoring programs, geographic distribution, geologic position, river basins, and hazard zones. Major conclusions were: (1) current regulations favor upland placement of landfills; (2) pollution enclaves formed from floodplain sites are predictable if this location is to be used, the number in any one drainage basin must be considered to protect river water quality; (3) pollution enclaves formed from upland sites are less predictable because of deeper penetration and larger number of geologic units encountered from source to sink; (4) of all sites, 53.1% are in uplands, 41.5% are on valley walls or ravines, and only 5.4% occur on flood plains; (5) approximately 35% of permitted landfills have required monitoring; and (6) there is high correlation between the area of each hazard zone and the present landfills found in each. Data gathered from the three upland sites are somewhat limited but several conclusions were reported: leachate concentrations are lower than those found in previous studies in Iowa floodplain sites; because more activities of man can be met between landfill and groundwater sink, the pollution enclave is more complex in shape and direction of flow; and production of leachate depends more on precipitation than in floodplain sites. (Majtenyi-IPA)
W79-00502

EVALUATION OF ULTRAVIOLET/OZONE TREATMENT OF ROCKY MOUNTAIN ARSENAL (RMA) GROUNDWATER (TREATABILITY STUDY),
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5D.
W79-00538

AN AERIAL SURVEY OF WATERBIRD COLONIES ALONG THE UPPER MISSISSIPPI RIVER AND THEIR RELATIONSHIP TO DREDGED MATERIAL DEPOSITS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W79-00542

COLONIAL BIRD USE AND PLANT SUCCESSION ON DREDGED MATERIAL ISLANDS IN FLORIDA; VOL. I: SEA AND WADING BIRD COLONIES,
Seabird Research Inc., Culver City, CA.
For primary bibliographic entry see Field 6G.
W79-00543

COLONIAL BIRD USE AND PLANT SUCCESSION ON DREDGED MATERIAL ISLANDS IN FLORIDA; VOL. II: PATTERNS OF PLANT SUCCESSION,
Seabird Research Inc., Culver City, CA.
For primary bibliographic entry see Field 6G.
W79-00544

UNDERGROUND BIOMASS DYNAMICS AND SUBSTRATE SELECTIVE PROPERTIES OF ATLANTIC COASTAL SALT MARSH PLANTS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2I.
W79-00545

AN ASSESSMENT OF THE POTENTIAL IMPACT OF DREDGED MATERIAL DISPOSAL IN THE OPEN OCEAN,
Terco Corp., College Station, TX.
For primary bibliographic entry see Field 5C.
W79-00549

INVESTIGATION OF SUBAQUEOUS BORROW PITS AS POTENTIAL SITES FOR DREDGED MATERIAL DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. D. Broughton.
Available from the National Technical Information Service, Springfield, VA 22161, Price codes: A09 in paper copy, A01 in microfiche. Technical Report D-77-5, May 1977. 190 p, 34 fig, 118 tab, 62 ref.

Descriptors: *Borrow pits, *Submarine canyons, *Dredged material disposal, *Subaqueous disposal areas.

Surveys knowledge of inventories, describes and evaluates the potential for using subaqueous pits, holes, or depressions as dredged material disposal sites. Scope was limited to an investigation of the estuaries, bays, rivers, and continental shelf areas of coasts of the United States, including the Great Lakes. All subaqueous depressions whether caused by dredging, extraction activities, or natural erosional events, were included. Surveys revealed little research has been accomplished on the effects of pits, holes, or depressions on the aquatic environment. However, the degradation of bays, estuaries, and shelf areas, the importance of these locales to the survival and growth of numerous aquatic species, and increasing public awareness in these areas, will probably result in increased research. A subaqueous site inventory resulted in the location of 125 former, existing, or potential subaqueous pits, holes, or natural depressions. Data collected for each of these sites were recorded and compiled along with site location maps. Site data were examined with reference to pertinent literature to obtain qualitative descriptions of the sites. Description of trenches and canyons, beach replenishment or construction aggregate sites, and shell dredging sites were derived in terms of extreme values and average conditions. (WES)
W79-00550

POTENTIAL EFFECTS OF DEEP-WELL WASTE DISPOSAL IN WESTERN NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-00625

TREATMENT OF DYEING EFFLUENTS - BY OXYGENATION, ELECTROLYSIS FLOCCULATION, SEPARATION AND FILTRATION, TO YIELD A SOLVENT SUITABLE FOR FURTHER DYEING.
For primary bibliographic entry see Field 5D.
W79-00728

COLONIAL NESTING SEA AND WADING BIRD USE OF ESTUARINE ISLANDS IN THE PACIFIC NORTHWEST,
Graham (John) Co., Seattle, WA.
C. F. Peters, K. O. Richter, D. A. Manuwal, and S. G. Herman.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-17, May 1978. 220 p, 46 tab, 40 fig, 36 ref, 4 append.

Descriptors: *Birds, *Estuarine environment, Islands, *Pacific Northwest U.S., Habitats, *Shore birds, *Wading birds, Dredged material, *Dredged material disposal, *Waste disposal sites, Colonial birds.

Twenty-three natural and dredged material islands were examined in seven locations from Anacortes, Washington, to Coos Bay, Oregon, to establish the relationships between plant communities and use by colonial nesting waterbirds for both types of islands, as well as the actual bird use of dredged material islands in the Pacific Northwest. Nine islands were found to be used for nesting by one or a combination of glaucous-winged gulls, western-glaucous-winged (hybrid) gulls, ring-billed gulls, Caspian terns, and common terns. Colonies of great blue herons were found on two islands 61 and 97 km from the mouth of the Columbia River. Habitat maps were prepared for each island studied and detailed floristic descriptions of each bird colony evaluated. Colony location, breeding phenology, and nesting success were analyzed with respect to existing flora, environmental stress, island physiography, and human disturbance. Results showed that although dredged material deposition influenced an island's physical dimensions, topography, and substrate, plant communities were physiognomically similar to natural islands. Seabird colonization occurred irrespective of dredging history. Nesting populations appeared to be greater in areas of low human disturbances. Colonization and productivity were primarily related to protection from environmental stress. (WES)
W79-00750

AQUATIC DISPOSAL FIELD INVESTIGATIONS, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. D. Wright, D. B. Mathis, and J. M. Brannon.
Technical Report D-77-20, May 1978. 89 p, 13 tab, 5 fig, 19 ref, 3 append.

Descriptors: *Environmental effects, *Aquatic environment, Pollutants, Water quality, *Sediments, On-site investigations, Dredged material, *Dredged material disposal, *Waste disposal sites, *Galveston Bay(Tex), Texas, *Offshore disposal, Ocean waste disposal.

Investigated in 1975 and 1976, the physical (sedimentological), chemical, and biological impacts of dredged material disposal at an authorized disposal site offshore Galveston, Tex. A hopper dredge was used for dredging and disposal, and most of the dredged material consisted of clean sand and sandy silt from the Galveston Bay Channel. A small amount of contaminated material from the Texas City Turning Basin was also placed in the disposal site. Results indicate the authorized disposal site was appropriate for the disposal of material from the dredged areas. Sediment movement after disposal was away from the dredged areas; disposition would not occur in navigation channels. As expected, material deposited in the shallow parts of the disposal site had a rather rapid rate of erosion and dispersal, while that placed in the deeper areas tended to remain in place throughout the study period. The chemical impact of disposal on water quality and sedimentological parameters was minimal. Although some changes were observed, these had little, if any, significance. Biological impacts also appeared to be of marginal significance. Changes in the abundance and types of organisms in disposal areas could not be distinguished from changes in reference areas. (WES)
W79-00751

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; AN ENVIRONMENTAL INVENTORY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
S. P. Cobb.
Technical Report D-77-6, May 1978. 119 p, 27 tab, 41 ref, 6 append.

Descriptors: *Environmental effects, *Sedimentation, *Aquatic environment, New York, Dredged material, *Dredged material disposal, *Waste disposal sites, *Eaton's Neck, Long Island Sound(NY).

Investigates the environmental effects of open water dredged material disposal at the Eatons Neck Disposal Site in central Long Island Sound, New York. Environmental conditions are described at the Eatons Neck Disposal Site as they were four years after cessation of disposal operations. Dredged material, building rubble, and other materials were dumped at the site for about 70 years (1900 to 1971); 9,841,000 m3 of dredged sediments were placed at the site from 1954 to 1971. Any effects of the presence of dredged material at the site on nutrients, metals, and other chemical variables in the central sound are minimal and are probably overshadowed by effects of sewage effluents and other river inputs. There were few significant differences in the abundance and composition of the benthic macrofauna between sampling stations located on the dredged material deposit and the reference stations. Results of hydrodynamic, bathymetry, and sediment studies showed no evidence of dispersion of dredged material from the site. Thus it appears that the Eatons Neck site is suitable, from a confinement standpoint, for the disposal of dredged sediments. (WES)
W79-00752

FIELD STUDY OF THE MECHANICS OF THE PLACEMENT OF DREDGED MATERIAL AT OPEN-WATER DISPOSAL SITES,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
H. J. Bokuniewicz.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-7, April 1978. 2 vols. (Vol 1: Main text and App A-I; 318 p, 8 tab, 29 fig, 18 ref); Vol 2: App J-O).

Descriptors: *Dredged material, *Dredged material disposal, *Waste disposal sites, *Ocean waste disposal.

A field study of the mechanics of the placement of dredged material at five locations: an estuarine site on the Atlantic, one on the Pacific coast, two sites in the Great Lakes, and one in the open ocean. The objective was to observe all the processes by which dredged material is emplaced on the bottom at a disposal site. Instrument arrays were designed to define the transit of dredged material in time and space from the moment of its release until its final deposition. Methods used included optical transmittance, acoustic pulse echo and water flow measurements with instrument arrays, and water sampling by continuous pumping. Additional observations were made to characterize the mechanical properties of the dredged material, its quantity, and the rate at which it is released into the receiving water. Observations demonstrate the dependence of the placement processes on water depth, the currents at the disposal site, and the properties of the dredged material. Accurate, controlled placement is possible under a wide range of disposal site conditions. Control of the placement can be attained through selection of dredging method, design of the containing vessel, and choice of disposal site characteristics. (WES)
W79-00755

INVESTIGATION OF CONTAINMENT AREA DESIGN TO MAXIMIZE HYDRAULIC EFFICIENCY.
Gallagher (Brian J.) and Co., Los Angeles, CA.

Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-12, May 1978. 194 p, 7 tab, 81 fig, 78 ref, 5 append.

Descriptors: *Flod characteristics, *Sedimentation, Mathematical models, Computer programs, *Containment areas, *Dredged material disposal, *Waste disposal sites, *Hydraulic efficiency.

Investigates methodologies for improving the hydraulic efficiencies of dredged material containment areas and develops general guidelines for the proper design and operation of containment areas and their inlet and outlet arrangement. Consists of (a) a review of published literature and technical reports, (b) site visits and field tests at ten active disposal areas to obtain recent operational data, (c) development of a mathematical models and computer programs to predict flow patterns and retention times of different containment area configurations, and (d) formulation of a general methodology for the design of efficient containment areas. Adding spur dikes to increase the effective length-to-width ratio, prevent short-circuiting between inlet and outlet, and retard wind-induced circulation was the most economical method of maximizing hydraulic efficiency, particularly for large, square-shaped areas. Other recommendations include the specification of minimum ponding depths based on selective withdrawal principles and the design of long, rectangular weirs to prevent flow concentration and resuspension problems. (WES)
W79-00757

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX A: EFFECTS OF DREDGED MATERIAL DISPOSAL ON DEMERSAL FISH AND SHELLFISH IN ELLIOT BAY, SEATTLE, WASHINGTON,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
J. R. Hughes, W. E. Ames, and G. F. Slusser.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-24, May 1978. 105 p, 20 tab, 11 fig, 25 ref, append.

Descriptors: *Environmental effects, *Washington, *Demersal fish, *Shellfish, Dredged material, *Dredged material disposal, *Waste disposal sites, *Duwamish Waterway, Elliott Bay.

This report determines the effects of dredged material disposal on demersal fish and shellfish at the disposal site. A standard Marinovich 'try net' sampled the disposal site and two reference sites. Catches of both fish and shellfish were inconsistent at the three sites with respect to both numbers and species, indicating a seasonal fluctuation in both abundance and composition. Statistical analyses showed that differences in abundance and composition were significant among the different sampling sites and the different sampling periods. However, experimental design and inherent differences among the sampling sites made it difficult to determine whether the catch differences were attributable to effects of the dredged material disposal or population fluctuations due to migratory behavior patterns. It was concluded that the quantity of dredged material dumped during the study did not have a lasting detrimental effect on the demersal fish and shellfish populations at the disposal site. Recommend future studies include a longer time for collecting baseline data, characteristics of the reference sites be more comparable to the disposal site, and disposal operations be conducted in a manner similar to that which is used in actual practice so the results might have general application. (WES)
W79-00759

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, MILLER SANDS MARSH AND UPLAND HABITAT DEVELOPMENT SITE, COLUMBIA RIVER, OREGON; APPENDIX F: POST-PROPAGATION ASSESSMENT OF WILDLIFE RESOURCES ON DREDGED MATERIAL,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
J. A. Crawford, and D. K. Edwards.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-38, May 1978. 191 p, 13 tab, 2 fig, 66 ref, 4 append.

Descriptors: *Marshes, *Columbia River, *Habitats, *Wildlife, *Wildlife habitats, Plant populations, On-site investigations, *Dredged material, *Waste disposal sites.

Wildlife response to plant propagation on a dredged material island in the lower Columbia River was assessed from July 1976 through August 1977. Plantings were done in late summer and fall of 1976. Data on birds, mammals, and terrestrial macroinvertebrates were collected, analyzed, and compared with data from other regions of the United States. Natural beach, marsh, upland, tree-shrub, planted marsh, and planted upland habitats were examined. The planted marsh was used by fewer bird species than a reference marsh; however, a trend near the end of the study indicated that use of both will eventually be similar. Upland platings apparently increased the number and diversity of species which used adjacent upland areas. Waterfowl fed and nested in the upland plantings, preferring a barley/bentgrass/red clover mix for feeding and a reed canary grass/red fescue/hairy vetch mix for nesting. Few small mammals were traped, but it appeared that the Townsend'S vole population increased in the uplad canary grass/fescue/vetch mix. Macro-invertebrate populations increased on the upland. Platings did not have dramatic effects on the populations. Avian density ad diversity were mostly unaffected. But in some instances, the number and type of species change. (WES)
W79-00760

CHARACTERIZATION OF CONFINED DISPOSAL AREA INFLUENT AND EFFLUENT PARTICULATE AND PETROLEUM FRACTIONS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W79-00763

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. G. Boone, M. A. Granat, and M. P. Farrell.
Technical Report D-77-30, May 1978. 100 p, 27 ref, 20 fig, 8 tab, 5 append.

Descriptors: *Aquatic environment, *Columbia River, *Bottom sediments, Sedimentation, Dredged material, *Dredged material disposal, *Waste disposal sites.

Physical data indicate that dredged material deposited in the nearshore zone off the mouth of the Columbia River maintains its identity relative to sorrounding sediments for periods of years and migrates north at a rate of approximately 0. 6 kilometre per year. Chemical data suggest that the release of dredged material at the disposal area has no measurable effect on either ambient water quality or quality of the sediments. Dredged material removed from the Columbia River entrance channel can be characterized as fine to medium sand with insigficant levels of pollutants. Bottom sediments examined from the tidal delta in the region of disposal site B consistently showed higher levels of nutrients and metals than sediments from adjacent sampling sites. Biological studies indicate that the disposal of dredged material had a measurble effect on both the benthic macroinvertebrates and the demersal finfish at the experimental disposal area. Benthic macroinvertebrate stations exposed to direct burial by dredged material had significantly higher diversity values and lower density values than unaffected stadtions. Demersal fish studies indicate that species diversity, species richness, and catch per uit effort indices were depressed following disposal. (WES)
W79-00764

PRODUCTION AND UTILIZATION OF AQUATIC PLANT COMPOST,
Ontario Ministry of the Environment, Rexdale. Water Resources Branch.
For primary bibliographic entry see Field 5G.
W79-00772

HYDRILLA SILAGE PRODUCTION, COMPOSITION AND ACCEPTABILITY,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5G.
W79-00773

PREPARATION OF LIQUID FUEL AND NUTRIENTS FROM MUNICIPAL WASTE WATER,
For primary bibliographic entry see Field 5D.
W79-00838

DISTRIBUTION AND ABUNDANCE OF BENTHIC MACROFAUNA IN THE SEWAGE SLUDGE DISPOSAL AREA, NEW YORK BIGHT APEX, FEBRUARY 1975,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W79-00930

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK-NEW JERSEY OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W79-00931

A STUDY OF THE SOURCES, TRANSPORT, AND REACTIONS OF SUSPENDED PARTICLES IN WATERS OF THE NEW YORK BIGHT,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-00993

5F. Water Treatment and Quality Alteration

METHODS TO EFFECT COST REDUCTIONS IN MUNICIPAL WATER SYSTEMS,
Mississippi Univ., University Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6C.
W79-00678

TREATMENT CONTROL APPARATUS FOR WATER SYSTEMS,
J. R. Bury.
U.S. Patent No. 4,094,786, 7 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 693, June 13, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, *Control systems, Mechanical control, Timing, Instrumentation, Automatic control, Chemical treatment, Liquid feeders.

A control apparatus for liquid water treatment systems has a float sensitive switch; and means for connecting the small tank to the water reservoir so that the water in the small tank drops responsive to a drop in water level in the reservoir. Activation of the float switch causes voltage to flow both to a solenoid operated water valve and an electric motor actuated totalizer having a digital read out. Cam devices are adapted to determine a predetermined time period during which the switch is held closed. The invention permits the direct injection with a high degree of accuracy of those chemical solutions adapted to be added to a water reservoir in relatively high concentration is such manner that the treatment solution injection is proportional only to the total make up of water delivered to the reservoir. (Sinha-OEIS)
W79-00820

SULFUR GAS REMOVING AND SOLID PARTICLE FILTER FOR WELL WATER,
R. J. Kemper.
U.S. Patent No. 4,094,789, 6 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 694, June 13, 1978.

Descriptors: *Patents, *Water wells, *Water sources, Deep wells, Water purification, *Water treatment, Water quality control, Filters, Sulfur, Gases, Aeration.

A need exists for an apparatus which will be capable of removing sulfur gas from the water pumped at a deep water well and which will also be capable of filtering other impurities out of the water. The filter of this invention includes a structure where jets of water pumped from a deep well are thoroughly commingled with jets of air under pressure. The jets of water and air are impacted against a splash plate to effect further commingling of the air and water. The air is thereafter vented from the water after which the water passes through a filter body for removing solids and other impurities. Substantially all of the gas, a major portion of which may comprise sulfur gas, is driven from the water and whatever small quantity of sulfur gas remains in the water is highly diluted by the air under pressure commingled with the water. (Sinha-OEIS)
W79-00821

SOFTENING UNIT FOR APPLIANCE,
Sta-Rite Industries, Inc., Racine, WI. (Assignee).
E. C. Grout.
U.S. Patent No. 4,090,963, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 4, p 1424, May 23, 1978.

Descriptors: *Patents, *Water softening, *Water treatment, *Water quality control, Ion exchange, Resins, Domestic water, Regeneration.

A water softening unit positioned between the mixing valve and washing basket of a washing machine includes a housing having a water inlet and outlet and an inlet for the introduction of salt into the housing. A partition divides the housing into a regeneration chamber and an ion-exchange chamber communicating with one another at one end of the partition. A pressure relief valve is located in the partition. A flow restriction valve located between the housing inlet and the regeneration chamber restricts flow through the softening unit when actuated, thereby allowing complete and thorough regeneration. The valve is normally open and when operated manually or otherwise to its alternate or actuated position, it remains in its actuated condition until the regeneration operation is completed. (Sinha-OEIS)
W79-00823

ACID DISPENSER FOR WATER SOFTENER UNIT,
Ecodyne Corp., Lincolnshire, IL. (Assignee).
D. A. Bakken, R. A. Henderson, and E. J. Tischler.
U.S. Patent No. 4,090,964, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 4, p 1424, May 23, 1978.

Descriptors: *Patents, *Water softening, *Water treatment, Ion exchange, Resins, Iron, Acids, Equipment, Regeneration.

Water softener units utilizing ion exchange resin particles must be regenerated periodically with a brine solution to restore the water hardness removing ability of such particle. When iron is present in the water being treated it is advantageous to include weak acids, such as citric acid, in the regeneration solution. A supply of such acid is stored in a separate container and a metered dose is dispensed into the brine tank during each regeneration cycle of the water softener. The dispenser utilizes a generally hat-shaped diaphragm that flops from one surface of a metering chamber to the opposite surface when acted upon by either pressure or suction. The diaphragm essentially lines one-half of the chamber at a time, and its movement either draws acid into the chamber or expels the acid from the chamber. (Sinha-OEIS)
W79-00824

GEOTHERMAL ACTUATED METHOD OF PRODUCING FRESH WATER AND ELECTRIC POWER,
For primary bibliographic entry see Field 3A.
W79-00826

SEQUESTERING OF CA++ AND MG++ IN AQUEOUS MEDIA USING ZEOLITE MIXTURES,
Union Carbide Corp., New York. (Assignee).
A. F. Denny, A. J. Gioffre, and J. D. Sherman.
U.S. Patent No. 4,094,778, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 690, June 13, 1978.

Descriptors: *Patents, *Water treatment, *Water softening, *Ion exchange, Zeolites, Hardness(Water), Calcium, Magnesium, *Water treatment, Synergistic effects.

The invention relates in general to the removal or sequestration of calcium and magnesium cations from aqueous solutions, and more particularly to the softening of hard water by ion exchange using mixtures of zeolite A and zeolite X. Mixtures of zeolite A and zeolite X containing about 40 to 70 weight per cent of each species are found to exhibit a synergistic effect in the sequestering by ion exchange of calcium and magnesium ions in hard water. These zeolite mixtures can be advantageously used in detergent compositions as substitutes in part or in full for polyphosphate builders. (Sinha-OEIS)
W79-00851

WATER PURIFICATION MEANS AND METHOD,
A. S. Behrman.
U.S. Patent No. 4,094,779, 6 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 690, June 13, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality, Domestic water, Filtration, Odor, Taste.

A filtration system for purifying a relatively small volume of water and for removing objectionable tastes and odors from drinking water is described. An inverted container of the water to be purified is supported above a filter which in turn is supported above a bottom container for receiving the effluent from the filter. The upper container is provided with an outlet tube which extends into the filter and is provided with means for regulating the flow of water to the filter. The filter holds a disposable filter medium in the form of a thin 'sandwich' of two outer sheets of readily permeable material and a thin inner layer of activated carbon particles between the two outer sheets. In operation, water flows from the upper container through the filter into the bottom container, the rate of flow of water from the upper container being controlled automatically by the lvel of water in the filter. (Sinha-OEIS)
W79-00852

TESTS OF COAGULANTS FOR THE REDUCTION OF VIRUSES, TURBIDITY, AND CHEMICAL OXYGEN DEMAND,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
S. P. Shelton, and W. A. Drewry.
Journal American Water Works Association - Vol. 65, No. 10, p 627-635. October 1973, 9 fig, 5 tab, 24 ref. OWRT A-018-TENN(5).

Descriptors: *Coagulation, *Viruses, Turbidity, Biochemical oxygen demand, Turbidity, Chemical oxygen demand, *Water treatment, Bacteriophage.

This study attempts to ascertain (1) how effective different chemical coagulants and polyelectrolytes are in virus removal; and (2) how results, using the same primary coagulants, correlate for a relatively unpolluted raw surface water, a moderately polluted surface water, and a secondary wastewater-treatment-plant effluent with respect to virus removal. Aluminum sulfate, ferric chloride, and ferric sulfate are the most promising of the group of primary coagulants tested from the standpoint of f2 bacteriophage remova. These coagulants are effective in the removal of COD, color, suspended solids, and turbidity. Aluminum sulfate is the most effective coagulant, whereas ferric chloride and ferric sulfate are comparable and less effective. The cationic polyelectrolyte tested is not satisfactory as a primary coagulant because of its poor floc formation and settling characteristics as well as its inability to facilitate removal of turbidity and COD. Virus removals with the cationic flocculant were only moderate, Anionic, nonionic, and cationic polyelectrolytes have only minor significance in virus removal. The use of sodium aluminate with aluminum sulfate does cause a marked increase in virus removal. There seems to be promise that a simple mathematical relationship exists between raw-water COD and the optimum dosage of primary coagulants for virus and turbidity removal. The f2 bacteriophage is an excellent virus with which to work and appears very similar to many animal viruses of concern. (Larson-Tenn)
W79-00868

VIRUS REMOVAL BY CHEMICAL COAGULATION,
D. W. York, and W. A. Drewry.
Journal American Water Work Association, Vol 66, No. 12, p 711-716, December 1974. 3 fig, 2 tab, 33 ref. OWRT A-018-TENN(6).

Descriptors: *Coagulation, *Viruses, *Flocculation, Public health, Bacteriophage, Chemical precipitation, *Water treatment.

Water treatment plants must employ a process which will remove and/or inactivate viruses to a high degree in order to protect public health. Conventional water treatment methods including chlorination have not been completely acceptable in regards to virus removal. A comparison was made of the efficiency of virus removal of a wide range of coagulants and coagulant aids. The f2 bacteriophage was used in all experimental work. Standard procedures were used for both flocculation tests (jar tests) and virus enumeration. The test water was obtained from the surface of Fort Loudoun Lake in Knoxville, Tennessee. Aluminum sulfate and ferric chloride were most effective in removing the virus from the test water. Both aluminum sulfate and ferric chloride were capable of removing over 99 percent of the f2 bac-

teriophage. Cationic polyelectrolytes were unsatisfactory as primary coagulants due to their inability to remove turbidity, color, and COD. Cationic, nonionic, and anionic polyelectrolytes as coagulant aids with aluminum sulfate did not significantly increase the performance of the coaulation system above that obtained with aluminum sulfate alone. The addition of a small dose of sodium aluminate with aluminum sulfate did not increase the removal of the f2 bacteriophage but did serve to increase the reduction of COD while building a dense, rapid-settling floc. The colloidal-titration technique appears to give a reasonable indication of the isoelectric point. (Larson-Tenn)
W79-00869

ANALYTICAL REPORT NEW ORLEANS AREA WATER SUPPLY STUDY.
Environmental Protection Agency, Dallas, TX. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W79-00981

5G. Water Quality Control

EFFECTS OF MECHANICAL MIXING IN RESERVOIRS ON SEASONAL AND ANNUAL GROWTH RATES OF FISHES,
Oklahoma State Univ. Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 2H.
W79-00514

WASTEFREE TECHNOLOGY, (IN RUSSIAN),
A. V. Pavlov.
Gig Sanit 8, p 8-11, 1976.

Descriptors: Technology, *Industrial wastes, Sewage effluents, *Water pollution control, *Water quality standards, USSR.

Determination of the term wastefree technology, and principles of its classification are given. Plans to create sewage-free industries under inclusion of the reutilization of water supply are discussed. Such reverse water supply systems are already in operation in the Soviet Union in plants of the nonferrous metals, petro-chemical, textile, synthetic polyamide and polyester fiber production industries, and in petroleum refineries. Antipollution measures to protect air from industrial emissions, at present conducted by the iron and steel industry in the Ukrainian SSR (USSR), are outlined.--Copyright 1978, Biological Abstracts, Inc.
W79-00517

EXPERIENCE IN HYGIENIC EXPERTISE OF INDUSTRIAL CONSTRUCTION PROJECTS, (IN RUSSIAN),
Sverdl. Inst. Ind. Hyg. Occup. Dis., Sverdlovsk, USSR.
M. D. Glikshtein, and M. G. Chetaltdinov.
Gig Sanit 1, p 92-95, 1977.

Descriptors: *Public health, Water quality standards, Air pollution, Heating, *Human health, *Water pollution control.

Changes in roles, controls and guidelines of health and hygiene agencies affecting building and reconstruction workers were discussed. Areas of focus were air quality, water sources, waste water, heating, ventilation, detrimental physical factors, illumination and washroom facilities.--Copyright 1978, Biological Abstracts, Inc.
W79-00518

EFFECTS OF ANTIMYCIN ON STREAM INSECTS,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-00525

POLLUTION IN RUNOFF FROM NONPOINT SOURCES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W79-00527

EFFECTS OF SOIL INJECTION OF LIQUID DAIRY MANURE ON THE QUALITY OF SURFACE RUNOFF,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W79-00528

INVESTIGATION OF SUBAQUEOUS BORROW PITS AS POTENTIAL SITES FOR DREDGED MATERIAL DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W79-00550

ZOOPLANKTON STANDING CROPS IN THE DISCHARGE OF LAKE FRANCIS CASE, 1966-1972,
Fish and Wildlife Service, Yankton, SD.
For primary bibliographic entry see Field 5C.
W79-00551

A MODEL OF RENEWABLE RESOURCES AND LIMITATION OF DEPOSIT-FEEDING BENTHIC POPULA TIONS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
For primary bibliographic entry see Field 5C.
W79-00575

ACID LAKE RENOVATION,
Peabody Coal Co., Central City, KY. Regional Lab.
W. A. Rosso.
In: 7th Symposium on Coal Mine Drainage Research, October 18-20, 1977, Louisville, Kentucky, p 61-70. 5 fig, 4 tab, 9 ref.

Descriptors: *Lakes, *Lake restoration, *Acid mine water, *Water pollution treatment, *Limestones, *Acid lakes, Kentucky, Peabody Coal Company, River Queen Mine(KY), Invertebrates, Mine water, Mine drainage, Fish, Insects, Amphibians, Reptiles, Mollusks, Costs, Impoundments, Aquatic plants, Biological communities, Ecosystems.

Five acid lakes created in 1967 during surface coal mining at the Peabody Coal Company's River Queen Mine in Muhlenberg County, Kentucky were successfully restored through treatment with limestone. The treatment applied was 44.8 metric tons of agricultural limestone/ha on problem areas within each lake's watershed, and certain extremely toxic areas caused by extensive waste coal and gob were covered by grading. The limestone was blown over the lake surface using a truck with blower attachment, except at lake 5 where only the watershed was treated. The lakes, all extremely acidic prior to treatment (pH 3.0-4.3), attained the state water quality standard of pH 6.0 within six months, again with the exception of lake 5, which took 18 months. Renovation costs never exceeded estimated costs of draining and filling, and ranged from 10-100% of those costs. Before treatment all lakes were devoid of fish, and fauna consisted primarily of chironomid and ceratopogonid larvae and a few aquatic beetle species. The only aquatic vascular plants were the cattail Typhaslatifolia (all lakes) and narrow-leafed cattail T. angustifolia (lake 2 only). After treatment diverse communities of vertebrates and invertebrates appeared, mostly through natural invasion, but supplemented by fish stocking. Macroinvertebrate orders increased from four to nine; frogs, toads, turtles, and snakes appeared; and wetland birds and mammals appeared or increased. (Lynch-Wisconsin)
W79-00576

TO TELL THE TRUTH: IMPERFECT INFORMATION AND OPTIMAL POLLUTION CONTROL,
Massachusetts Inst. of Tech. Cambridge.
E. Kwerel.
The Review of Economic Studies, Vol 44, October 1977, p 595-601. 2 fig, 1 ref.

Descriptors: *Economics, *Optimization, *Pollution taxes(Charges), *Permits, *Information, *Pollution abatement, Licenses, Public policy, Regulation, Costs, Damages, Equations, Waste disposal, Incentives.

A new pollution control scheme incorporating both effluent charges and licensing is proposed which will induced firms to reveal the true costs of cleaning up pollution. To design an optimal pollution control plan it is necessary to know both the damages resulting from pollution and the costs of reducing pollution; this scheme fulfills the latter requirement. The paper first examines incentives of firms to deceive the regulatory authority when confronted with either a pure licensing or a pure effluent charge policy. The analysis, based on one pollutant, assumes that all waste discharged has same impact regardless of firm, and that governmet can assign a dollar value to expected damages. The mixed plan is shown to balance exactly the incentive to overstate control costs under licensing with the incentive to understate costs under effluent charges, so that firms are induced to make socialy-optimal reports to the government. The plan consists of: (1) issuance of a fixed stock of transferable licenses, and (2) payment to firms of a subsidy per license in excess of emissions. Given the market price of licenses, the firm seeks to minimize the sum of treatment costs plus license fees minus rebates. The result is that each firm's total costs are minimized when the goverment sets the socially optimal effluent subsidy and stock of licenses. (Lynch-Wisconsin)
W79-00588

ENVIRONMENTAL QUALITY AND GAINS FROM TRADE,
Mannheim Univ. (West Germany).
H. Siebert.
KYKLOS, Vol. 30, No. 4, 1977, p 657-673. 1 fig, 12 ref.

Descriptors: *Economic-environmetal tradeoffs, *Welfare(Economics), *International trade, *Economics, *Environmental economics, *Pollution abatement, *Public policy, Environmental effect, Industry, Mathematical models, Model studies, Pollution taxes(Charges), Air pollution, Equations.

A two-commodity model, with production of the first commodity considered pollution-intensive, is used to assess the extent to which gains from international trade are altered when effects on environmetal quality are considered. Two situations are analyzed: (1) The home country, which has a comparative price advantage in the first commodity, specializes in its production; emissions increase and environmental quality declines, with reduction in overall benefits to society from trade. (2) The home country enacts an appropriate environmental policy, such as emission taxes. Analysis shows that: (2) if a country exports its pollution-intensively produced commodity, its gains from trade are accompanied by a decline in its environmental quality; (2) if an environmental protection policy is enacted under these circumstances, environmental quality will be improved but gains from trade will be reduced; (3) with the introduction of environmental policy, resource use and output in the pollution intensive sector will decline; (4) quantities exported and imported will fall and pollution abatement will increase; (5) there will be an overall

welfare gain from environmental policy as long as marginal social costs of production are higher than the marginal value of the commodity in consumption, or the emission tax is lower than marginal environmental damage. In an open economy emission taxes must be set according to the same rules as in a closed economy (emission tax-marginal environmental damage prevented. (Lynch-Wisconsin)
W79-00589

THE CONTINUING PROBLEM OF NON-NATIVE FISHES IN FLORIDA,
P. L. Shafland.
Fisheries, Vol. 1, No. 6, November-December 1976, p 25. 4 ref.

Descriptors: *Florida, *Fish, *Exotic fish, *Fish control agents, *Biocontrol, Canals, Swamps, Marshes, Ditches, Hoplian malabaricus, Tilapia mariae, Tilapia zillii, Cichlasoma trimaculatum, Betta splendens, Water pollution effects, Environmental effects, Ecosystems.

The number of reproducing populations of non-native fishes in Florida continues to increase, with 25 species and five hybrids verified. Added to those listed by Courtenay, et. al (1974) are: Hoplian malabaricus, Tilapia mariae, T. zillii, Cichlasoma trimaculatum, and Betta splendens. The establishment rate is indicative of south Florida's environmental instability, due primarily to physical alteration of water flow patterns and other forms of aquatic pollution. Introduction of the fish is due to the irresponsibility of a few tropical fish farmers, in some cases; however, T. zillii has been purposely introduced as an aquatic weed biocontrol agent. The South American tigerfish (H. malabaricus), reportedly a voracious piscivore, is potentially the most harmful of these exotic species; the infested area connects with a swamp and open marsh draining into the Little Manatee River. The location of the Tilapia mariae infestation in the Dade County canal system largely precludes renovation. The T. zillii population was located in a small borrow pit south of Miami, which, upon renovation, yielded seven exotic species in addition to T. zillii: T. mariae, T. mossambica, Hypostomus plecostomus, Corydoras sp., Danio malabaricus, Capoeta tetrazona, and Carassium auratus. A remnant population of Cichlasoma trimaculatum probably exists in the Tampa area following an attempted renovation; the species was found to be euryhaline, and had access to saltwater. The population of Siamese fighting fish (Betta splendens) is confined to a small area of Dade County in ditches where renovation is impractical. (Lynch-Wisconsin)
W79-00591

TILAPIA--A MANAGEMENT TOOL FOR BIOLOGICAL CONTROL OF AQUATIC WEEDS AND INSECTS,
Caifornia Univ., Riverside. Div. of Biological Control.
W. J. Hauser, E. F. Legner, R. A. Medved, and S. Platt.
Fisheries, Vol. 1, No. 6, November-December 1976, p 24.

Descriptors: *Tilapia mossambica, *Tilapia zillii, *Biocontrol, *Aquatic weed control, *Insect control, *Fish, Chara, Potamogeton pectinatus, Najas guadalupensis, Myriophyllum spicatum, Mosquitoes, Midges, California, Algal control, Algae, Filamentous algae, Rice, Ponds, Irrigation canals, Ditches, Water temperature.

Two species of the fish Tilapia have been used successfully for biocontrol of several aquatic plant species and mosquitoes and midges. Tilapia have also been cultured as a protein source, and for sport and commercial fising. Tilapia zillii and T. mossambica have been used alone or in combination for aquatic weed and insect control; T. zillii appears more efficient that T. mossambica in control of higher aquatic weeds and chara. Two factors limit use of T. zillii as a weed control agent: (1) it cannot survive low winter water temperatures in irrigation canals and ditches in southern California, where extensive research is underway; and (2) it prefers sago pondweed (Potamogeton pectinatus), southern naiad (Najas guadalupensis), and Chara spp. over Eurasian water milfoil (Myriophyllum spicatum). Because of its temperature requirements, Tilapia is limited to southern states, and in California cultures must be maintained continuously using geothermal artesian water. In waterways where M. spicatum occurs with more preferred weeds, the former may reach nuisance proportions; an integrated control program incorporating both biological and mechanical techniques is being developed. Excellent weed control has resulted with the fish used alone at stocking rates of 1450-2500 fish/ha. In rice ponds a mixed culture of T. zillii and T. mossambica controlled chara, filamentous and mat-forming algae, N. guadalupensis, and P. pectinatus; control was superior to herbicides. (Lynch-Wisconsin)
W79-00592

THE RELATIONSHIP BETWEEN COASTAL-ZONE MANAGEMENT AND OFF-SHORE ECONOMIC DEVELOPMENT,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W79-00593

IMPACT OF ENERGY DEVELOPMENT ON COLORADO RIVER WATER QUALITY,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
A. B. Bishop.
Natural Resources Journal, Vol. 17, No. 4, p 649-71, October, 1977. 6 fig, 5 tab.

Descriptors: *Desalination, *Mexico, *Colorado River basin, *Water quality control, Energy, Brines, Saline water, Water pollution sources, Legislation, Comprehensive planning, Protection.

Energy development in the Colorado River Basin has created a broad range of potential water quality problems. Point source pollution is controllable by current water quality laws, such as Public Law 92-500. Related activities, land surface disturbance, air emissions, mining operations, and water withdrawals could also affect water quality. These activities are not as easily controlled. Mexico and the United States consider salinity the chief water quality problem. The future development of compact-apportioned waters in the basin has been analyzed through water and slat mass balance model studies. Total dissolved solid concentrations are seen to increase below Imperial Dam. Thus, by taking water that serves for dilution out of the river, salinity concentrations are more highly affected. Salinity impact from energy development is reduced due to the control strategy of no salt return in the form of highly concentrated brines. The Colorado River Regional Assessment study has estimated this reduction to be on the order of 34 mg/l; the Salinity Forum considered the reduction to be 27 mg/l. When formulating programs designed to meet water quantity and quality committments to Mexico, these effects must be considered. (Spiegel-Florida)
W79-00605

WHERE DO ENVIRONMENTAL LAWS AND REGULATIONS STAND TODAY.,
Environment Information Center, Inc., New York.
L. A. Rich.
Chemical Engineering, Vol. 83, No. 22, p 9, 11, 13, 15, 17, October 18, 1976.

Descriptors: *Legislation, *Federal water pollution control act, *Chemical industry, Water pollution control, Standards, Clean air act, Effluents, Toxins, Environmental effects, Solid wastes, Industrial wastes, Regulation.

The chemical process industry's activities and wastes are claimed to have a great effect on the environment. Accordingly, controlling state and federal agencies are expected to strictly police the industry. The author of this article strongly recommends that each chemical process industry familiarize itself with environmental laws and regulations, both on the state and federal level. In order to aid this process, an overviw of federal legislative developments is presented. The 1972 Federal Water Pollution Control Act (FWPCA) has experienced mole legislative change in 1976 than any other major environmental law. The basic goals of the FWPCA are: (1) drastic reduction of discharged pollutants; (2) achievement of high water quality; and (3) elimination of toxic-pollutants discharge. Pursuant to the FWPCA, six major sets of regulations have been promulgated. These are: (1) National Pollutant Discharge Elimination System; (2) Effluent Guidelines and Standards; (3) Pretreatment Standards; (4) Oil and Hazardous Substances Rules; (5) Ocean-Dumping Rules; and (6) Toxic Pollutant Standards. The changes in these regulations are examined in some detail. In addition, changes in the Clean Air Act and Ambient Standards, the National Environmental Policy Act, solid-waste laws, noise regulations and the Toxic Substances Control Act are discussed. (Quarles-Florida)
W79-00607

THE OTHER WATER POLLUTION (NONPOINT SOURCE POLLUTION),
For primary bibliographic entry see Field 5B.
W79-00614

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 2, DULUTH AND ALEXANDRIA, MINN.).
Hearings, Sucomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, June 2, 3, 1977, Serial No. 95-H25, 789 p.

Descriptors: *Federal water pollution control act, *Minnesota, *Water treatment, *Water pollution control, Effluents, Toxins, Federal government, Water pollution, Industries, Technology, Municipal water, Industrial water.

This second in a series of hearings by the Subcommittee on Environmetal Pollution of the Senate Committee on Environmental Pollution ofthe Senate Committee on Environmnent and Public Works involves a comprehensive review of the Federal Water Pollution Control Act. The purpose of the hearings isto determine what, if any, amendments to the Act are necessary. The instant hearing consists of a general review o the issues involved in the Minnesota water pollution program, while focusing specifically on the issues of best available technology for industries, and management of treatment facilities in municipalites. The 1972 law required two phases of pollution control for industrial sources. First phase goals have been almost completely realized. The second phase, based on the best technology achieveable by 1983, is the subject of these hearings. The projected economic and environmental implications are discussed by witnesses representing various perspectives within Minnesota. The second panel of the hearing explores the series of requirements for municipal facilities established by the 1972 Act, and their present application in Minnesota. Specifically, the panel seeks to know whether the requirement of proportionate user charges is necessary to assure protection of the Federal investment. (Quarles-Florida)
W79-00617

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 5, LEMARS, IOWA).
Hearing, Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, June 24, 1977, Serial No. 95-H25, 164 p.

Descriptors: *Federal water pollution control act, *United States, *Legislation, *Federal government, Regulation, Water pollution, Pollution abatement, Water quality, Public utilities, Environment, Water policy.

In June, 1977, the United States Senate's Subcommittee on Environmetal Pollution met in LeMars, Iowa, to discuss implementation of the 1972 Federal Water Pollution Conltrol Act (FWPCA) Amendments. This subcommittee, chaired by Senator Edmund Muskie, derives its power from the Senate Committee on Environmental and Public Works. The opening statement was made by Senator John Culver, from Iowa. Senator Culver thought it fitting that the hearing be held in Iowa because of the state's long history of improvement and preservation of water quality. He cited several examples, including the fact that the first succesful wastewater treatment plant west of the Allenghenies was built in Iowa. The Senator discussed cost-sharing programs, soil erosion problems, agricultural productivity, and other topics. In conclusion, he emphasized his desire that the hearing facilitate better understanding of water quality programs in Iowa. After the opening statement, witnesses in many fields, including the dairy and cattle industries, the league of Women Voters, and many others, were given an opportunity to make presentations. Testimony given by these witnesses was entered into the record, along with many graphs and charts pertinent to the discussion. All are included in this document. (Spiegel-Florida)
W79-00618

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 8, WASHINGTON, D.C.).
Hearings Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, June 21, 22, 23, 1977, Serial No. 95-H25, 619 p.

Descriptors: *Federal government, *Federal water pollution control act, *Water quality standards, *Evaluation, Legislation, Administrative agencies, Project planning, Cost sharing, Federal project policy, Environment, Public utilities.

In June, 1977, hearings were held before the Subcommittee on Environmental Pollution, a subgroup of the U.S. Senate's Committee on Environmental and Public Works. Chairperson of the Subcommittee was Senator Edmund Muskie. In the senator's opening statement he discussed issues and questions dealing with the Clean Water Act, including recommendations made by the National Commission on Water Quality. He reminded his fellow senators that their task was to focus on 'what may be' the most significant need of the water pollution program--a major revision of the construction grant program. He urged those interested in the program to discuss with the subcommittee the feasibility of a reduced Federal share of projects costs and the validity of reduction of eligible categories for construction grants. William Reilly, former federal Environmental Protection Agency Administrator, considered it now appropo to undertake a mid-term review of the Federal Water Pollution Control Act, a topic of major significance at the hearing. He also encouraged adoption of a system of charges for delayed compliance with the Act. Numerous witnesses were called to discuss these pertinent topics. All testimony is included. (Spiegel-Florida)
W79-00619

SCHISTOSOMIASIS DISTRIBUTION IN THE YEMEN ARAB REPUBLIC (IN RUSSIAN),
Volgogradskii Gosudarstvennyi Meditsinskii Inst. (USSR). Div. of Biology.
For primary bibliographic entry see Field 5C.
W79-00633

IOWA WATER QUALITY MANAGEMENT PLAN: DES MOINES RIVER BASIN,
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 679, Price codes: A18 in paper copy, A01 in microfiche. July 1976, Glossary, 51 tab, 79 fig. See also Supporting Document and other individual Basin reports.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water (pollution), *Waste water treatment, *Water quality management(applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal wastes, Municipal water, Lagoons, Sediment control, Economics, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Des Moines River Basin(IA), River basin planning, Areawide planning, Facilities planning, *Nonpoint pollution sources, Federal water pollution control Act, Sections 303(e), 208 and 201, Point sources, Structural alternatives, Nonstructural alternatives, Waste load allocations, Waste water collection, Secondary treatment, Primary treatment, Advanced waste treatment, Tillage practices, Woodland management.

This basin plan for the Des Moines River Basin, one of six major basins partially located in Iowa, was prepared in fulfillment of Phase I requirements of Section 303 (e) of PL 92-500. This plan includes a determination of existing water quality, inventories of development patterns and basin characteristics, applicable standards, significant point and nonpoint sources of pollution and waste load allocations in the Des Moines River Basin. Findings show that municipal population will increase by 8% to 790,000 by 1990. Only 136 of the 217 incorporated municipalities currently have collection and treatment facilities. Many facilities have no secondary treatment; waste stabilization lagoons serve nearly 50% of the municipalities and a large number of industries. Water quality violations due to point source discharges have been documented at flows well above the 7-Q-10 low flow. Violations at higher stream flows are probably attributable to rural and urban runoff and all lakes and reservoirs in the basin are subject to potential eutrophication from this runoff. Land disposal of municipal sewage sludge is the most economical ultimate disposal method currently being used in the planning area. Waste load allocations show that a significant number of dischargers will be required to provide advanced waste treatment to meet 7-Q-10 low flow standards, especially in the Upper Des Moines and Racoon River sub-basins. It is recommended that the State Water Plan give high priority to water quality. Nonstructural management measures should be considered to enhance and protect water quality. Land disposal of wastewater and municipal sludge should be further studied. Regionalization of facilities should be considered; 201 facilities planning is recommended for 9 specific areas. Structural measures to protect water quality are outlined.
W79-00645

IOWA WATER QUALITY MANAGEMENT PLAN: SUPPORTING DOCUMENT,
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 680, Price codes: A10 in paper copy, A01 in microfiche. July 1976, 167 p, 9 tab, 37 fig, Glossary.

Descriptors: *Planning, *River basins, *Iowa, *Water quality, *Water quality managemet(Applied), *Water quality standards, Agricultural runoff, Urban runoff, Standards, Waste water(Pollution), Municipal wastes, Low flow, Modeling, Solid wastes, River basin planning, Facilities planning, *Nonpoint pollution sources, Waste load allocation, Primary treatment, Secondary treatment, Advanced waste treatment. *Federal water pollution control act, Sections 303(e) and 201, Northeast Iowa River Basin, Cedar-skunk-Des Moines-Southern Iowa and Western Iowa River Basins.

)This volume is a supporting document for river basin plans for six major basins partially located in Iowa--Northeast Iowa, Cedar, Skunk, Des Moines, Southern Iowa, and Western Iowa Basins. Prepared under Section 303(e) of PL 92-500, the plans include a determination of existing water quality, applicable standards and significant point and nonpoint sources of pollution. The plans identify and set forth to correct the water quality problems of each basin. This docment contains general information applicable to the six basins. The information is essentially of a supporting or background nature and was not considered to warrant duplication in each plan. The document covers five general topics: general characteristics, water quality, nonpoint pollution sources, segment analysis methodology and waste load allocation, and treatment alternatives. Included in a discussion of Iowa's general characteristics is a description of climatology, hydrogeology and ground water quality. Under water quality, Iowa's Standards and Stream Classifications are delineated. Available water quality data were gathered and evaluated to present the best available picture of recent Iowa water quality. Existing water quality is described and compared to standards. The problems of nonpoint pollution are addressed, including both characterizations of combined sewer overflows and urban and rural runoffs and the potential pollution from typical sources. The water quality modeling techniques and assumptions used to evaluate the impact of wastewater discharges upon stream quality under low flow conditios are presented in the discussion of segment analysis and waste load allocation methodologies. Finally, alternative treatment processes are described, followed by a general discussion of arrangements for upgrading of existing facilities.
W79-00646

IOWA WATER QUALITY MANAGEMENT PLAN: NORTHEASTERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 681, Price codes: A18 in paper copy, A01 in microfiche. July 1976, 45 tab, 56 fig, Glossary.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water(Pollution), *Waste water treatment, *Water quality, *Water quality management(Applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal wastes, Municipal water, Lagoons, Economics, Sediment control, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Northeastern Iowa Basin(IA), River basin planning, Areawide planning, *Nonpoint sources, Federal Water Pollution Control Act, Sections 303(e) and 208, Point sources, Structural alternatives, Non-structural alternatives, Waste load allocations, Waste water collection, Secondary treatment, Primary treatment, Advanced waste treatment, Tillage practices, Woodland management.

This basin plan for the Northeastern Iowa River Basin, one of 6 major basins partially located in Iowa, was prepared in fulfillment of requirements of Section 303(e) of PL 92-500. The plan includes a determination of existing water quality, inventories of development patterns and basin charac-

teristics, applicable standards, significant point and nonpoint sources of pollution and waste load allocations in the Northeastern Iowa Basin. Findings show that the municipal population will increase by 25% to nearly 475,000 by 1990. Only 129 of the 164 incorporated municipalities currently have collection and treatment facilities. Many facilities have no secondary treatment. Waste load allocations indicate that a significant number of dischargers will be required to provide advanced waste treatment to meet 7-Q-10 low flow water quality standards. Land disposal of digested municipal sludge currently is the most economical ultimate disposal method. There are several planning areas in the basin where currently available data are inadequate, including information on combined sewers, infiltration, and BODs and nutrient loadings and assimilative capacities. It is recommended that the State Water Plan give high priority to water quality. Additional qualitative stream monitoring during low flow conditions is suggested, and additional studies of waste load allocations should be made at times other than low flow conditions. More data concerning physical stream characteristics are needed. Complete retention lagoons should be considered where applicable. Consideration should be given to designating the Davenport area as a 208 planning area. The report also recommends that Iowa and Minnesota agree on stream classifications and effluent standards for interstate waterways. Non-structural management measures should be considered. Structural measures to protect water quality are outlined. (Zayac-NC)
W79-00647

IOWA WATER QUALITY MANAGEMENT PLAN: WESTERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield VA 22161 as PB-264 682, Price codes: A17 in paper copy, A01 in microfiche. July 1976, Glossary, 47 tab, 49 fig.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water(Pollution), *Waste water treatment, *Water quality, *Water quality management(Applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal wastes, Municipal water, Lagoons, Sediment control, Economics, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Western Iowa River Basin(IA), River basin planning, Areawide planning, Facilities planning, *Nonpoint pollution sources, Federal water pollution control act, Sections 303(e), 208 and 201, Point sources, Structural alternatives, Nonstructural alternatives, Waste load allocations, Waste water collection, Secondary treatment, Primary treatment, Advanced waste treatment, Tillage practices.

This basin plan for the Skunk River Basin, on of six major basins partially located in Iowa, has been prepared in fulfillment of Phase I requirements of Sect. 303(e) of PL 92-500. The plan includes a determination of existing water quality, inventories of development patterns and basin characteristics, applicable, standards, significant point and nonpoint sources of pollution and waste load allocations. Findings show that municipal population will increase by 23% to about 360,000 by 1990. 131 of the 148 incorporated municipalities have collections and treatment facilities. Many facilities have no secondary treatment; waste stabilization lagoons serve 47% of the municipalities and a large number of the industries. Water quality violations have been documented at flows higher than the 7-Q-10 low flow. Lakes ad impoundments are subject to potential eutrophication from urban and rural runoff. Land disposal of digested municipal sludge is the most economical method of ultimate disposal. It is recommended that the State Water Plan give high priority to water quality. Additional qualitative stream monitoring during low flow conditins is suggested; additional studies of waste load allocations should be made at times other than low flow conditions to determine nonpoint contributions. More data concerning physical stream characteristics are needed. Complete retention lagoons rather than small mechanized treatment plats should be considered. Two possible new 208 regions should be considered, along with formation of an intergovernmental water quality managemet agency for the Iowa Great lakes region. Regionalization of facilities should be considered; 201 facilities planning is recommended for the Dension area. Nonstructural management measures should be considered. Structural measures are outlined.
W79-00648

IOWA WATER QUALITY MANAGEMENT PLAN: SKUNK RIVER BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 683, Price codes: A06 in paper copy, A01 in microfiche. July 1976, Glossary, 39 tab, 22 fig.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water(Pollution), *Waste water treatment, *Water quality, *Water quality management(Applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal wastes, Municipal water, Lagoons, Sediment control, Economics, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Skunk River Basin(IA), River basin planning, Areawide planning, Facilities planning, Federal Water Pollution Control Act, Sections 303(e), 208 and 201, Nonpoint sources, Structural alternatives, Nonstructural alternatives, Waste load allocations, Development, Waste water collection, Secondary treatment, Primary treatment, Advanced waste treatment, Tillage practices, Woodland management.

This basin plan for the Skunk River Basin, one of six major basins partially located in Iowa, has been prepared in fulfillment of Phase I requirements of Section 303 (e) of PL 92-500. The plan includes a determination of existing water quality, inventories of development patterns and basin characteristics, applicable standards, significant point and nonpoint sources of pollution and waste load allocations in the Skunk River Basin. Findings show that municipal population will increase by 39% to nearly 250,000 by 1990. Of 87 incorporated municipalities, only 53 have collection and treatment facilities. Many facilities have no secondary treatment; waste stabilization lagoons serve nearly 50% of the municipalities and a large number of industries. Water quality violations have been documented at flows higher than the 7-Q-10 low flow; all lakes and impoundments in the basin are subject to potential eutrophication from urban and agricultural runoff. Land disposal of digested municipal sludge is currently the most economical means of ultimate disposal. A significant number of dischargers will be required to provide advanced waste treatment to meet 7-Q-10 low flow water quality standards. Except for the Mississippi River, the Skunk River Basin is water quality limited. It is recommended that the State Water Plan give high priority to water quality. Nonstructural management measures should be considered to enhance and protect water quality. Land disposal of wastewater and municipal sludge should be further studied. Regionalization of facilities should be considered where wasteload allocations have indicated; 201 facilities planning is recommended for 5 areas. Structural measures to enhance and protect water quality are outlined.
W79-00649

IOWA WATER QUALITY MANAGEMENT PLAN: SOUTHERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 684, Price codes: A14 in paper copy, A01 in microfiche. July 1976, 37 tab, 36 fig, Glossary.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water(Pollution), *Waste water treatment, *Water quality, *Water quality management(Applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal waste, Municipal water, Lagoons, Sediment control, Economics, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Southern Iowa River Basin(IA), River basin planning, Areawide planning, Facilities planning, Federal Water Pollution Control Act, Sections 303(e), 208 and 201, Point sources, Structural alternatives, Nonsturctural alternatives, Waste load allocations, Secondary treatment, Waste water collection, Primary treatment, Advanced waste treatment, Tillage practices, Woodland management.

This basin plan for the Southern Iowa, has been prepared in fulfillment of Phase I requirements of Section 303(e) of PL 92-500. The plan incudes a determination of existing water quality, inventories of development patterns and basin characteristics, applicable standards, significant point and nonpoint sources of pollution and waste load allocations in the Southern Iowa Basin. Findings show that municipal population will increase by 25% to nearly 145,000 by 1990. Only 62 of 132 incorporated municipalities have collection and treatment facilities; many facilities have no secondary treatment. Waste stabilization lagoons serve nearly 51% of the municipalities and a large number of industries. Water quality violations have been documented at flows higher than 7-Q-10 low flows; all lakes and reservoirs in the basin are subject to potential eutrophication from urban and agricultural runoff. Land disposal of digested municipal sludge is the most economical means of ultimate disposal. A significant number of dischargers will be required to provide advanced waste treatment to meet 7-Q-10 low flow water quality standards. It is recommended that the State Water Plan give high priority to water quality. Nonstructural management measures should be considered to enhance and protect water quality. Land disposal of wastewater and municipal sludge should be further studied. Regionalization of facilities should be considered where wasteload allocations have indicated; 201 facilities planning is recommended for 7 areas. There is already a 4-county 208 planning area surrounding Rathburn Lake; no more are recommended. Structural measures to enhance and protect water quality are outlined. (Zayac-NC)
W79-00650

IOWA WATER QUALITY MANAGEMENT PLAN: IOWA-CEDAR RIVER BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 685, Price codes: A18 in paper copy, A01 in microfiche. July 1976, 40 tab, 53 fig, Glossary.

Descriptors: *Planning, *River basins, *Iowa, *Water resources development, *Waste water(Pollution), *Waste water treatment, *Water quality management(Applied), Agricultural runoff, Urban runoff, Standards, Land use, Zoning, Population, Municipal wastes, Municipal water, Lagoons, Sediment control, Economics, Low flow, Sludge digestion, Sludge disposal, Monitoring, Administration, Recycling, *Iowa-Cedar River Basin(IA), River basin planing, Areawide planning, Facilities planning, Federal Water Pollution Control Act, Sections 303(e), 208 and 201, Structural alternatives, Nonstructural alternatives, Waste load allocations, Waste water collection, Secondary treatment, Primary treatment, Advanced waste treatment, Tillage practices, Woodland management.

This basin plan for the Iowa-Cedar River Basin, one of six major basins partially located in Iowa, has been prepared in fulfillment of Phase I requirements of Section(e) of PL 92-500. The plan includes a determination of existing water quality, inventories of development patterns and basin characteristics, applicable standards, significant point and nonpoint sources of pollution and waste load allocations in the Iowa-Cedar River Basin. Findings show that municipal population will increase by 19% to about 690,000 by 1990. Of 207 incorporated municipalities, only 133 have collection and treatment facilities. Many facilities have no secondary treatment. Waste stabilization lagoons serve 45% of the basin's municipalities and a large number of industries. Water quality violations have been documented at flows well above the 7-Q-10 low flow, mostly attributable to point source discharges. Violations at high stream flows have also been documented; all lakes and impoundments in the basin are subject to potential eutrophication from rural and urban runoff. Land disposal of digested municipal sludge is the most economical ultimate disposal method in the planning area. A significant number of dischargers will be required to provide advanced waste treatment to meet 7-Q-10 low flow water quality standards. It is recommended that the State Water Plan give high priority to water quality. Non-structural management measures should be considered to enhance and protect water quality. Land disposal of wastewater and municipal sludge should be considered where wasteload allocations have indicated; 201 facilities planning is recommended for 13 areas. Structural measures to protect water quality are outlined. (Zayac-NC)
W79-00651

PROCEEDINGS OF THE FIRST US/USSR SYMPOSIUM ON COMPREHENSIVE ANALYSIS OF THE ENVIRONMENT.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W79-00654

SEVERAL PROBLEMS OF THE RATIONAL CONSTRUCTION AND EXPLOITATION OF RESERVOIRS AND CANALS AS EXAMPLIFIED BY THE UCHINSKOYE RESERVOIR AND THE MOSCOW CANAL, (IN RUSSIAN),
All-Union Hydrobiological Society, Moscow (USSR).
A. V. Frantsev.
Gidrobiol Zh 12(5), p 13-19, 1976.

Descriptors: Bank, *Canals, Epiboly, Erosion, Exploitation, Fishes, Fodder, Grass, Livestock, Moscow, Plants, Recreation, Reservoir operation, *Reservoirs, Seeding, Trees, Uchinskoye, USSR, *Water pollution.

Examples and methods for biolgical improvement of water quality in supply reservoirs and canals are discussed, including strengthening of banks, tree planting, the seeding of water plants, use of oblique booms, aeration, collection of swimming pollutants, construction of settling tanks in canals, control of epibolies and sowing of fodder grass. The effect of the growth of water plants in shallow waters on the fish population is discussed. Experience in biological amelioration of the Moscow canal and Uchinskoye reservoir (Russian SFSR, USSR) indicate that simple and inexpensive measures can simultaneously halt erosion of banks, improve recreational conditions, provide supplemental feed for livestock and increase the fish productivity of water bodies--Copyright Biological Abstracts, Inc.
W79-00655

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA.
Denver Regional Council of Governments, CO.
Addendum No. 1, July 1971, 22 p, 7 tab, Exhibit.

Descriptors: *Water quality, *Waste water treatment, *Water quality management(Applied), Biochemical oxygen demand, Sludge, Waste, Government, Sewage disposal, Costs, *Denver(CO), *Water quality management, Environmental improvements, Environmental assessment.

This Addendum was prepared at the request of EPA for supplemental information to the original Interim Plan. Five points were raised by EPA and responded to by the Denver Regional Council of Governments (DRCOG). (1) Individual governmental and organizational units and their relationships with the DRCOG should be further defined. Advisory committees have been established under and by DRCOG; the report sets out how these agencies interrelate. (2) A schedule of priorities and costs should be developed for designated improvements in water quality management. DRCOG presents estimated project costs for each improvement area. (3) The original plan should discuss further the impact of the proposed improvements upon existing water quality and water quality standards. Actions taken to gather the necessary data for determining water quality impacts are listed, as well as the proposed improvements by area; the purpose and benefits of each improvement are discussed. (4) Alternative regional treatment plans should be proposed. Reference is made to a previous report in which this issue is examined and data provided. (5) A revised Environmental Statement should be submitted in accordance with 6 specific requirements. DRCOG discusses 6 points presented in its Environmental Assesssment--probable impact, probable unavoidable adverse impacts, alternatives considered, relationship between short-term uses of the environment and enhancement of long-term productivity, irreversible commitment of resources, and public objections based on environmental issues. Additional needed improvements in sewerage systems are presented, by basin area, with estimated costs given for these improvements.
W79-00656

HARBOR AND WATERFRONT DEVELOPMENT PLANNING,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 2L.
W79-00657

A COMPUTER MODEL OF THE POPULATION OF CHIRONOMIDS (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5B.
W79-00659

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS WATER QUALITY MANAGEMENT STUDY. VOLUME I.
Templeton, Linke and Alsup, Salt Lake City, UT.; and Engineering Science, Inc., Berkeley, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 574, Price codes: A19 in paper copy, A01 in microfiche.
Prepared for Utah State Department of Social Services, Bureau of Water Quality, June 1975, 84 fig, 86 tab. Sea also Volume II.

Descriptors: *Planning, *Water quality, *Water management(Applied), *Water use, *Water resources development, Management, Population, Land use, Economics, Economic evaluation, Pollutants, Inflow, Infiltration, Waste water treatment, Waste water disposal, Cities, Irrigation, Agricultural runoff, Urban runoff, Surface waters, Utah, Environmental effects, *Utah Lake(UT), *Jordan River(UT), Natural environment, Point sources, Nonpoint sources, Federal Water Pollution Control Act-Section 303(e), Public participation.

This report was prepared in compliance with federal regulations for river basin plans as defined in Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972. The basic purpose of the study was to develop a comprehensive plant that would serve as a framework for future water quality planning and control activities within the Utah Lake-Jordan River hydrologic basins. Information necessary to develop a detailed picture of the study area--including a discussion of the natural environment and a population, land use and economic inventory--is presented first. Present water quality in the rivers and streams is then discussed and sources of pollution-causing wastes are identified. Present and future waste load allocations are estimated and treatment needs determined; alternative ways of handling municipal wastewaters were synthesized and evaluated with regard to cost, environmental factors, feasibility and overall effectiveness. Results of the public participation program are included in the report. The recommended plan first calls for the maintenance of sufficient flow rate levels to maintain a balance of flora and fauna. Point source pollution abatement is given first priority because of its immediate significance. Infiltration and inflow are addressed because of their excessive nature in many collection systems. Recommended plans for municipal wastewater management in 1980 are diagrammed; possible developments of the plans after 1980 are then presented. Some institutional possibilities for administration are discussed. Finally, measures for reducing urban runoff, mitigating the deleterious effects of nonpoint agricultural runoff and minimizing surface water pollution due to irrigation return flow are outlined. (Zayac-NC)
W79-00660

ASSESSING THE SOCIAL IMPACTS OF OIL SPILLS. PROCEEDINGS OF AN INVITATIONAL SYMPOSIUM.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 726, Price codes: A06 in paper copy, A01 in microfiche.
Proceedings of an invitational symposium cosponsored by the Institute on Man and Science and the U.S. Environmental Protection Agency held at Rensellaerville, New York on September 25-28, 1973, 129 p.

Descriptors: *Oil spills, *Water pollution, *Oil industry, *Economics, *Legislation, *Environmental effects, *Oil pollution, Compensation, Legal aspects, Recreation, Coasts, *Government policies, *Corporations, *Environmental impacts, Social impacts, Political science, Damage.

This report presents the results of an invitational symposium held to encourage the development of techniques and methodologies in the assessment of the social impact of oil spills. It is divided into topic areas which correspond to the individual session themes. These topics include general perspectives on oil spills, EPA's response to oil spills, legal and corporate response to oil spills, public interest groups' attitudes on oil spills and economic and political approaches to the problems caused by oil spills. The participants are from universities, government agencies, international conservation groups, corporations, and research laboratories both here and abroad. A brief narrative account of each session introduces the faculty presentations. These accounts describe the kinds of questions raised by the participants, delineate the major points of debate and discussion, and summarize the group response to the two learning exercises, posed as task team assignments, that were incorporated within the program's format. Two appendices are provided which include articles by environmental specialists not included in the formal program sessions. These articles are on the properties and environmental effects of oil, compensation for oil pollution damages, international activi-

ty responding to oil pollution damage from vessels at sea, and oil and the energy crisis. (Coan-NC)
W79-00661

THE NATIONAL ENVIRONMENTAL POLICY ACT AND FEDERAL WATER RESOURCES PLANNING: EFFECTS AND EFFECTIVENESS IN THE CORPS AND SCS,
Stanford Univ., CA. Dept. of Civil Engineering.
W. W. Hill.
December 1977, 257 p, Report No. IPM-4.

Descriptors: *Decision making, *Planning, *Evaluation, *Water resource planning, Alternative planning, Surveys, Formulation, *National Environmental Policy Act, *Army Corps of Engineers, *Soil Conservation Service, Implementation, Environmental planning.

The study's research objective is to measure changes in water resources planning and decision-making processes induced by the National Environmental Policy Act (NEPA). The water resources agencies examined are the field level offices of the Army Corps of Engineers--preauthorization planning (survey investigations) and the Soil Conservation Service (SCS)--small watershed planning. The research first examines factors which are necessary, but not sufficient, conditions for the achievement of NEPA's objectives. These conditions involve policy level responses and resource commitments which an agency must make if more substantive changes in planning and decision-making are to occur. Following this assessment, the analysis focuses more directly on changes in planning and decision-making. The evaluation focuses on: the perceptions of Corps and SCS field level personnel regarding NEPA's effects and effectiveness; the degree to which the agencies utilize a systematic interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision-making; the degree to which NEPA influences both the selection of alternatives considered (formulation) and the selection of a recommended alternative (evaluation); and increased access to and influence on agencies planning and decision-making processes. It is found that NEPA has had an effect on water resources planning and decision-making in the Corps and SCS. (Nessa-NC)
W79-00665

CAPE COD WATER QUALITY MANAGEMENT PLAN.
Massachusetts Water Resources Commission, Westborough. Water Quality Section.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 789, Price codes: A05 in paper copy, A01 in microfiche.
January 1976, 61 p, 11 tab, 5 fig, 4 append.

Descriptors: *Water quality, *Water quality control, *Water quality standards, *Planning, *Water pollution, *Water management(Applied), *Water pollution control, *Coastal areas, Regulation, Water resources, Land use, Shellfish, Storm runoff, Groundwater, Abatement, Massachusetts, *Cape Cod(MA), *Non-point pollution sources, River basin planning, 208 planning, Marine water resources, Coastal management.

This report describes the status of water quality on Cape Cod, MA. It also presents an inventory of past planning efforts and can be used as a guide for the 208 study authorized in 1976. Cape Cod, an area of 410 sq. miles, has 15 towns with a permanent population of 97,000. Although there are only a few small freshwater streams, ponds and lakes are abundant. Water quality problems exist on Cape Cod but the vast majority of the coastal waters are clean. Of the approximately 12,600 acres of productive shellfish, 350 acres, or 3%, are closed to fishing and swimming for not meeting the assigned classification standards. Some saltwater intrusion of groundwater has occurred in the north Truro-Provincetown area and some areas have high concentrations of iron and manganese in the groundwater. Non-point pollution is the main source of water pollution on Cape Cod. These sources are boating, sanitary wastes from watercraft, oil spillage, drainage from landfill areas and septic tanks, and stormwater. The report briefly describes their impacts. Past efforts at planning for water quality management are recognized and both public and private actions in the conservation of water and land resources are identified. These actions include local enforcement of subsurface disposal regulations; establishment of local regulations to inhibit pond eutrophication; construction or expansion of small collection systems and possible intertown sewer service areas; and construction of pump-out facilities at marinas. The report concludes with a glossary of technical terms and a discussion of the rules and regulations for the establishment of minimum water quality standards and for the protection of the quality and value of water resources. (Coan-NC)
W79-00666

PLANNING AND INSTITUTIONAL CONSIDERATIONS IN WASTEWATER TREATMENT FACILITIES PLANNING, BOSTON, MASSACHUSETTS. PHASE I STUDY,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W79-00667

EVALUATION OF RECIRCULATING SYSTEMS FOR THE CULTURE OF CHANNEL CATFISH,
Memphis State Univ., TN. Dept. of Biology.
N. C. Parker, and B. A. Simco.
In: Proceedings of the 27th Annual Conference, Southeastern Association of Game and Fish Commissioners. p 474-487, 1973. 5 fig, 1 tab, 19 ref. OWRT B-028-TENN(2).

Descriptors: *Fish reproduction, *Recirculating systems, Evaluation, Water reuse, Recycling, Water quality, Water pollution control, Filters, *Channel catfish.

The development of nutritionally complete feeds has permitted the culture of channel catfish under increasingly intensive conditions. Recirculating raceways and tank culture systems have been the subject of several recent investigations. Ten recirculating systems were built at Memphis State University to evaluate their feasibility for the culture of channel catfish. It was concluded that: (1) Self-cleaning settling chambers and final clarifiers remove particulate matter and extend the life of biofilters. Biofilters will quickly detoxify ammonia to less innocuous nitrates. (2) Water quality is limited by system design; the design determines the maximum water quality obtainable when proper management practices are followed. Water quality in a flow-through system is controlled primarily by the rate of inflow. In a recirculating system, water quality is controlled by the fresh water inflow or exchange rate, the flow rate per tank, and the filter size. An increase in any of these variables will result in an increase in water quality. A formula relating water quality with design variables has been prepared. The recirculating systems, designed for this study, have produced in excess of 7 lbs/ft3 per tank and over 5 lbs/ft3 for the entire system. (Larson-Tenn)
W79-00682

CULTURE OF CHANNEL CATFISH IN A HIGH FLOW RECIRCULATING SYSTEM,
Memphis State Univ., TN. Dept. of Biology.
M. C. Broussard, Jr., N. C. Parker, and B. A. Simco.
In: Proceedings of the 27th Annual Conference, Southeastern Association of Game and Fish Commissioners. p 745-750, 1973. 2 fig, 1 tab, 10 ref. OWRT B-028-TENN(3).

Descriptors: *Fish reproduction, High flow, Water reuse, Recycling, *Recirculating systems, Dissolved oxygen, Temperature, Fish diseases, Water quality, *Channel catfish.

Fish production is limited by several factors, such as dissolved oxygen, temperature, disease and the build up of waste products. Although ponds normally support up to 2,000 lb/acre, Greene (1971) increased this carrying capacity to over 20,000 lb/acre by biofiltration and recirculation of the water. This study concluded that greater carrying capacities for the culture of channel catfish in closed recirculating systems can be obtained with high flow rates and filter to tank ratios. A density of 7.2 lb/ft3 was obtained in a 142 day growing period. Both updraft and trickling filters were effective in reducing ammonia levels without the removal of any significant amount of solid materials from the system. Solid wastes quickly clogged filters containing coal slag, but plastic scraps, oyster shells, teflon rings and styrofoam packing material served effectively as filter media. (Larson-Tenn)
W79-00683

DISSIPATION OF HEAT FROM COOLING PONDS,
Bhabha Atomic Research Centre, Bombay (India).
For primary bibliographic entry see Field 5B.
W79-00702

FACILITIES PLAN ADMINISTRATIVE REPORT FOR LEAD-DEADWOOD, SANITARY DISTRICT NO. 1, DEADWOOD, SOUTH DAKOTA.
CH2M Hill, Denver, CO.
For primary bibliographic entry see Field 5D.
W79-00707

MANUAL FOR METHODS OF QUICKLY VEGETATING SOILS OF LOW PRODUCTIVITY, CONSTRUCTION ACTIVITIES,
Midwest Research Inst. Kansas City, MO.
For primary bibliographic entry see Field 4D.
W79-00717

ICHTHYOLOGICAL INVESTIGATION OF THE PROTECTED HABITAT OF THE DANUBIAN SALMON (L.) ON THE RIVER TURIEC)CZECHOSLOVAKIA) AND SUGGESTIONS FOR ITS MANAGEMENT, (IN SLOVAK),
Laboratorium Rybarstva a Hydrobiologie, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 6B.
W79-00718

MECHANICAL DISPERSAL OF OIL STRANDED IN THE LITTORAL ZONE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
E. H. Owens.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 563-572, May 1978. 12 fig, 2 tab, 19 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Weathering, *Dispersion, *Oil pollution, Water pollution effects, Environmental effects, Littoral, *Outer Continental Shelf, Canada, Coastal processes.

The natural weathering and dispersion of oil stranded in the littoral zone depend on the type and volume of the oil and on the amount of available energy. Energy inputs can be biological, chemical, mechanical, or thermal; however, the single most important input appears to be from mechanical energy (winds, waves, tides, water levels, and ice). The residence time or persistance of stranded oils increase as mechanical energy

levels at the shoreline decrease. The primary inputs of mechanical energy at the shoreline are due to wave action, and energy levels vary depending on the wind regime, fetch areas, and local exposure of a section of coast. In cold or polar climates, energy levels at the shoreline are reduced by the presence of ice on the sea or an ice foot on the beach. This review of the concepts associated with littoral processes, in terms of the mechanical dispersal of stranded oil, provides the basis for estimation of the persistence of oil on shorelines. (Sinha-OEIS)
W79-00725

MEASURES AGAINST STORM WATER POLLUTION, (IN SWEDISH),
Chalmers Univ. of Technology, Goteborg (Sweden). Vatten Inst. Tek.
P. A. Malmquist, and G. Svensson.
Vatten 33(2), p 153-166, 1977.

Descriptors: *Storm water, *Water pollution control, Waste assimilative capacity, Path of pollutants, Mathematical models, Soils, Sweden, Vegetation.

Urban storm water causes by its large volume, its high water flow and its pollutant content considerable costs and damage of different kinds. The storm water pollutants may seriously affect the surface waters, the ground water, the soils and the vegetation and, in the combined system, the sewage treatment plants. The storm water pollutant loads must be decreased if the effects mentioned are to be avoided. This can be done in 2 complementary ways: by reducing the storm water pollutant sources and by decreasing the storm water flows. In a series of research projects at Chalmers University of Technology (Sweden) different methods of decreasing the pollutant loads were investigated. The choice between combined and separated sewage systems is important when the total pollutant load from a city is considered. For an investigation area, the combined system causes higher BOD (biochemical O2 demand) and nutrient loads, but lower suspended solids and heavy metal loads than does the separate system. If the storm water volumes are decreased by local infiltration and percolation, and if retention basins are used, the total pollutant loads can be considerably decreased, especially the loads from the combined system. The storm water pollutant sources are mainly atmospheric fallout, corrosion of building materials, and traffic. The choice of measures and the consequences thereof are a complicated problem, and the use of mathematical models of the planning type facilitates the decision-making. The best effects are obtained if the urban water balance is considered during the planning processes.--Copyright 1978, Biological Abstracts, Inc.
W79-00726

STATE OF THE STOCK OF STURGEON ACIPENSER BAERI BRANDT IN SIBERIAN RIVERS AND MEASURES TO INCREASE THEIR REPRODUCTION, (IN RUSSIAN),
N. P. Votinov, and V. P. Kas'yanov.
Vorp Ikhtiol. 14(5), p 796-805, 1974.

Descriptors: Acipenser-baeri, Artificial breeding, Fisheries, Reproduction, Rivers, Siberian, *Sturgeon, USSR, Water pollution control.

Data are presented on the current state of the stock of sturgeon (A. baeri) in the Ob-irtysh basin and Enisei and Lena Rivers in Siberia (USSR). At present the stock is in a stressed state owing to a decline in reproduction caused by hydropower construction, progressive pollution of the spawning grounds and an irrationally organized fishery. In recent years sturgeon catches have declined 4-fold in comparison to 1960-1964. To increase the abundance of sturgeon in the Ob-Irtysh basin, artificial breeding is necessary. In the Enisei and Lena basins, the fishery must be rationally organized.--Copyright 1975, Biologica Abstracts, Inc.
W79-00736

OILED SEABIRD RESCUE AND CONSERVATION,
Newcastle upon Tyne Univ. (England) Dept. of Zoology.
R. B. Clark.
Journal of the Fisheries Research Board of Canada, Vol 35, No 5, p 675-678, May 1978. 18 ref. From: Proceedings of the Symposium on 'Recovery Potential of Oiled Marine Northern Environments' held at Halifax, Nova Scotia, October 10-14, 1977.

Descriptors: *Oil pollution, *Environmental effects, *Birds, *Rehabilitation, Oil spills, Water pollution effects, *Outer continental shelf, *Torrey Canyon, United Kingdom, Petroleum hydrocarbons, Marine birds, Uria aalge, Alca torda.

Attempts were made to clean and rehabilitate nearly 8000 oiled birds (maily auks) following the wreck of the Torrey Canyon. This was an almost total failure and a Research Unit on the Rehabilitation of Oiled SEabirds was established in Newcastle upon Tyne to devise effective tratment methods. This has involved a study of the mechanism of water-repellency in seabird plumage and led to the developent of cheap, effective cleaning methods and full recovery of the birds within 2-3 wk of capture. These methods have been used successfully on small numbers of birds y amateurs and also operationally on larger numbers by the Research Unit. There have been only few ringing returns but at least some of the cleaned birds became reintegrated with the breeding populations after release. Even with appropriate organization and facilities it is doubtful whether the rescue and treatment of oiled birds can make a material contribution to seabird conservation, but there is often strong public pressure for the treatment of oiled birds and the development of suitable techniques makes this possible. (Sinha - OEIS)
W79-00740

RECOLONIZATION OF ROCKY SHORES IN CORNWALL AFTER USE OF TOXIC DISPERSANTS TO CLEAN UP THE TORREY CANYON SPILL,
Marine Biological Association ofthe United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W79-00741

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,
Woods Hole Oceanographic Institution, MA; and Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5C.
W79-00744

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turko (Finland). Inst. of Biology; and Turku Univ. (Finland).
For primary bibliographic entry see Field 5C.
W79-00747

THE PRODUCTION BIOLOGY OF EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM L.): A REVIEW,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W79-00768

NUISANCE AQUATIC MACROPHYTE GROWTH,
Army Engineer District, Walla Walla, WA.
For primary bibliographic entry see Field 4A.
W79-00769

ENVIRONMENTAL EFFECTS OF MECHANICAL HARVESTING,
Ontario Ministry of the Environment, Rexdale. Water Resources Branch.
For primary bibliographic entry see Field 4A.
W79-00770

MACROPHYTE CONTROL BY HARVESTING AND HERBICIDES: IMPLICATIONS FOR PHOSPHORUS CYCLING IN LAKE WINGRA, WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Botany.
S. R. Carpenter, and M. S. Adams.
Journal of Aquatic Plant Management, Vol. 16, p 20-23, June 1978. 4 fig, 24 ref. NSF DEB-7519777.

Descriptors: *Phosphorus, *Lake Wingra(WI), *Harvesting, *Aquatic weed control, *Eurasian water milfoil, *Eutrophication, *Herbicides, *Cycling nutrients, *Littoral, Mechanical control, Chemcontrol, Lakes, Madison(WI), Wisconsin, Macrophytes, Myriophyllum spicatum, Nutrient removal, Nutrients, Nutrient requirements, Limiting factors, Minerals, Urban runoff, Shallow water.

Harvesting Eurasian water milfoil (Myriophyllum spicatum) from shallow, eutrophic Lake Wingra, in Madison, Wisconsin, would remove an equivalent 37% annual net phosphorus load, 100% available phosphorus, and 22% total inorganic phosphorus in the upper 12 cm of littoral sediments. By contrast, herbicides would release at least 165 kg phosphorus into lake water within a few days, thereby increasing eutrophication. Such a nutrient pulse, equal to about 10% of the lake's annual net phosphorus load, would include considerable phosphate readily assimilable by algae. Lake Wingra, already eutrophic before settlement by Europeans in the area, receives a heavy nutrient loading from urban runoff, and though harvesting alone would not reverse the eutrophic process, harvesting plus reductions of point-source nutrient loads would significantly improve the lake's water quality. Annual harvesting would be necessary to deplete available phosphorus in the sediments because: (1) shoots obtain an unknown fraction of their phosphorus from the water. (2) available phosphorus in sediments is continually replenished by equilibration with insoluble forms, and (3) phosphorus is continually added to sediments by sedimentation. Harvesting would remove 15 kinds of minerals from the lake, including 10 essential plant nutrients. Maximum removal of phosphorus, the most critical process-limiting nutrient in the lake, would occur with a late August harvest. (Lynch-Wisconsin)
W79-00771

PRODUCTION AND UTILIZATION OF AQUATIC PLANT COMPOST,
Ontario Ministry of the Environment, Rexdale. Water Resources Branch.
I. Wile, J. Neil, G. Lumis, and J. Pos.
Journal of Aquatic Plant Management, Vol. 16, p 24-27, June 1978. 8 tab, 1 ref.

Descriptors: *By products, *Eurasian water milfoil, *Composts, *Aquatic plants, *Harvesting, *Fertilizers, Myriophyllum spicatum, Aquatic weed control, Mechanical control, Crop production, Flowers, Vegetable crops, Grasses, Trees, Fruit crops, Salt tolerance, Hydrogen ion concentration, Moisture content, Nutrients, Chemical analysis, Manure, Tobacco, Methodology.

Five composts utilizing harvested aquatic plants, primarily Eurasian water milfoil (Myriophyllum spicatum), were tested and found effective in

green house experiments with a variety of plants, vegetables, fruit, and turf grasses. Results demonstrated the value of composted aquatic plants as fertilizer ingredient, and indicate that with reduction of pH and salt levels, these composts would be equal or superior to existing commercial products. The composts, prepared in a high-rate aerobic composter, consisted of peanut shells to reduce moisture content and: (1) 78% air-dried aquatic plants, plus wet pondweed and poultry litter; (2) 83% unchopped aquatic plants and compost no. 1; (3) 80% chopped aquatic plants and compost no. 2; (4) 62% chopped aquatic plants, 21% tobacco paunch manure compost, and poultry litter; and (5) 68% chopped aquatic plants and 27% ground corn cobs. Chemical analyses of raw materials and composts are given in tables. Preliminary tests showed poultry litter produced extremely high salt levels (over .005 mhos). In experiments with top-watered Chrysanthemums, compost no. 4 produced plants and flowers superior to those grown in other composts or with peat moss; watering by capillary mat was unsatisfactory. Some composts stimulated growth of coleus, petunias, geraniums, creeping red fescue, marion kentucky bluegrass, perennial ryegrass, and germination of tomatoes and muskmelon, but not for white cedar due to high salt content. (Lynch-Wisconsin)
W79-00772

HYDRILLA SILAGE PRODUCTION, COMPOSITION AND ACCEPTABILITY,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
L. O. Bagnall, K. E. Dixon, and J. F. Hentges, Jr.
Journal of Aquatic Plant Management, Vol. 16, p 27-31, June 1978. 3 fig, 6 tab, 14 ref.

Descriptors: *Silage, *Hydrilla verticillata, *Cattle, *Feeds, *Aquatic plants, *By products, Aquatic weed control, Harvesting, Mechanical control, Pastures, Florida, Orange Lake(FL), Carbohydrates, Propionic acid, Citrus fruits, Moisture content, Hay, Equipment, Spoilage, Methodology.

Pressed Hydrilla verticillata made into silage with supplementary fermentable carbohydrate (dried citrus pulp, ground shelled corn, and propionic acid), was readily accepted by cattle. Steers consumed all of the hydrilla silage and coastal Bermudagrass hay offered them, but only 67% of hydrilla hay. Hydrilla harvested from Orange Lake, south of Gainesville, Florida, contained 7.5% dry matter initially and was screw-pressed to reduce moisture content. Fifteen kg was pressed in a 10-cm press for preliminary trials, 480 kg was pressed in a 20-cm press for preliminary animal acceptability trials, and 15,700 kg was chopped by forage harvester and pressed in a 30-cm press for animal acceptability and consumption trials. Pressed hydrilla was mixed with supplementary materials, packed into closed containers, and stored in 450-ml wide-mouthed polyethylene bottles, 208-liter drums, or 1.2 x 2.4-m culvert silos. Bottle samples were stored 300 days, barrel silages 113 days, and culvert silages 133 days. In general temperature rise caused by biological activity in the silage was small and brief. All pH levels were higher than the 3.5-4.0 common for high-quality silage of common terrestrial crops, normally an indication of low silage quality. Bottled hydrilla without dried citrus pulp became putrid, spoilage in barrels was 22-100%, and spoilage in culvert silos ranged from 17-25%. Odor of usable silage was typical of good silage. (Lynch-Wisconsin)
W79-00773

EFFECT OF WATER LEVEL FLUCTUATION AND HERBICIDE ON EURASIAN WATERMILFOIL IN MELTON HILL RESERVOIR,
Tennessee Valley Authority, Muscle Shoals, AL. Div. of Environmental Planning.
For primary bibliographic entry see Field 5C.
W79-00775

CHEMICAL CONTROL OF HYDRILLA,
Corps of Engineers, Washington, DC.
E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 16, p 38-40, June 1978. 4 tab, 9 ref.

Descriptors: *Chemcontrol, *Hydrilla verticillata, *Aquatic weed control, *Herbicides, *Diquat, *Copper, *Toxicity, *Reservoirs, Water pollution effects, Copper sulfate, Cutrine, Copper sulfate pentahydrate, Pesticide residues, Alkalinity, Ammonia, Nitrates, Dissolved oxygen, Fish, Florida, Inglis Reservoir(FL).

Growth pool simulations and large-scale field tests showed good control of Hydrilla verticillata by combinations of diquat and copper, with no toxic effects on fish. Residues of diquat and copper in the water were negligible 14 days after treatment, but there was a statistically significant increase in ammonia-nitrogen and a slow decline in nitrate-nitrogen. Little effect was detected on dissolved oxygen in surface waters. In the initial simulations diquat, diquat plus copper sulfate pentahydrate (CSP), copper sulfate, and encapsulated copper sulfate were applied to hydrilla in 3.4-m diameter plastic pools, and effects were monitored for eight weeks. Pools contained bluegills, largemouth bass, and channel catfish. No fish mortality resulted. Diquat plus CSP provided greatest effectiveness against hydrilla (100% after four weeks), followed by diquat alone (80-93% after eight weeks). Field tests were performed at two sites in Inglis Reservoir, western Florida, using diquat plus Cutrine (triethanolamine copper complex) and diquat plus CSP to hydrilla beds. Plant density estimates were made before treatment and 3-128 days after treatment. Diquat plus CSP was again the most effective, achieving 93% control after 82 days, declining to 74% after 128 days. Diquat plus Cutrine was 76% effective after 82 days, decreasing to 44% after 128 days. Satisfactory control persisted with both treatments for about nine months. (Lynch-Wisconsin)
W79-00776

TOXICITY OF SULFURIC ACID TO AQUATIC PLANTS AND ORGANISMS,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 5C.
W79-00777

AN APPROACH TO ESTIMATING THE STANDING CROP OF WATERHYACINTH,
Commonwealth Scientific and Industrial Research Organization, Brisbane (Australia). Long Pocket Labs.
I. W. Forno, and A. S. Bourne.
Journal of Aquatic Plant Management, Vol. 16, p 50-52, June 1978. 1 fig, 1 tab, 3 ref.

Descriptors: *Water hyacinth, *Standing crops, *Estimating, *Biocontrol, *Aquatic weed control, *Methodology, Equations, Eichhornia crassipes, Aquatic plants, Drying, Lagoons, Australia, Leaves, Petioles, Queensland(Australia).

A method for estimating the standing crop of water hyacinth (Eichhornia crassipes) categorizes plants as 'peaked' and 'nonpeaked' groups according to the distribution of leaves over classes defined by petiole length. Equations are presented for each group, which provide estimates accurate to within 10% of values obtained by weighing dried samples. Plants in three lagoons in southeastern Queensland, Australia, were used in developing the method. Leaves from each plant sampled were divided into five classes according to petiole length: 0-10 cm, 10-20 cm, 20-40 cm, 40-60 cm, and 60 cm. Leaves in each class were counted, dried to constant weight at 70C, and weighed, and mean dry wt/leaf determined for each class. It was apparent that a relationship existed between mean leaf weight and petiole length, but a substantial variation in mean leaf weights of different samples required modification of the simple equation for standing crop. Data indicated proportional allocation of leaves to each class was significant; this was due to conditions of peaked growth at the end of summer, compared with nonpeaked growth early in winter then cold weather stimulates production of shorter leaves with more bulbous petioles. Separation into the two groups is accomplished by means of a ratio of actual leaf weight to estimated leaf weight. The equation for the peaked group is 0.339 C1 + 0.685 C2 + 1.002 C3 + 1.848 C4 + 3.077 C5, and for the nonpeaked group 0.218 C1 + 0.409 C2 + 0.730 C3 + 1.313 C4 + 2.485 C5, where C1, C2, C3, etc. denote number of leaves in each class. (Lynch-Wisconsin)
W79-00779

A REVIEW OF CURRENT INTEREST AND RESEARCH IN WATER HYACINTH-BASED WASTEWATER TREATMENT,
Battelle Columbus Lab., OH.
R. K. Markarian, J. E. Balon, and A. C. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-33683, Price codes: A04 in paper copy, A01 in microfiche. Report BCL-OA-TFR-77-1, February 1977. 53 p, 9 fig, 10 tab, 33 ref, 2 append. NASA NASW-2800, Task Number 16.

Descriptors: *Water hyacinth, *Waste water treatment, *Reviews, *Treatment facilities, *Tertiary treatment, Nutrient removal, Eichhornia crassipes, Beneficial use, Aquatic plants, Sewage treatment, Industrial wastes, Municipal wastes, Research priorities, Institutional constraints, Regulation, Water quality standards, Effluent limitations.

A survey of researchers, literature, and potential users indicates that water hyacinth (Eichhornia crassipes) for wastewater treatment can provide a lower-cost method for small cities and towns to meet increasingly stringent effluent requirements. While there have been a few demonstrations of hyacinth systems during the past two years, little design data has been made available. Several full-scale projects are planned for 1977-78. At present there is no surce from which to purchase a treatment system or design which has been approved by appropriate regulatory agencies or for which there are demonstrated performance capabilities or cost information. Such a product may be available in three or four years, however, as several suppliers of conventional systems are testing hyacinth designs. Controlled experiments under realistic nutrient loading conditions are needed to develop a satisfactory system. Required data include: (1) optimal physical design (lagoon depth, area, holding time, and harvesting methodology); (2) construction and operating costs; (3) plant-escape prevention techniques; and (4) system performance under various loading conditions and temperature cycles. The best institutional arrangement for such testing would involve a joint effort of an engineering firm, wastewater treatment authority, regulatory agencies and a funding source such as EPA. The use, if any, of harvested plants is not of general concern. (Lynch-Wisconsin)
W79-00786

THE DISTRIBUTION OF AQUATIC WEEDS IN THE FINGER LAKES OF NEW YORK STATE AND RECOMMENDATIONS FOR THEIR CONTROL,
Eisenhower Coll., Seneca Falls, NY. Dept. of Biology.
L. Baston, Jr., and B. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 436, Price codes: A07 in paper copy, A01 in microfiche. Report for New York State Assembly Scientific Staff, Albany, June 1975. 123 p, 36 fig, 10 tab, 55 ref.

Descriptors: *Finger Lakes(NY), *Aquatic weed control, *Distribution, *Cayuga Lake(NY), *Eutrophication, *Eurasian water milfoil, New York, Lakes, Otisco Lake(NY), Skaneateles Lake(NY), Owasco Lake(NY), Seneca Lake(NY), Keuka Lake(NY), Canadaigua Lake(NY), Conesus Lake(NY), Biocontrol, Chemcontrol, Mechanical control, Macrophytes, Species composition, Species diversity, Density, Myriophyllum spicatum, Nutrients, Sedimentation, Littoral.

Eurasian water milfoil (Myriophyllum spicatum) surveyed in Cayuga Lake in summer-fall 1974 was the worst weed problem in eight of New York State's finger lakes. Seneca Lake is not as severely infested, but has significant milfoil population at its north end. Skaneateles, Otisco, Owasco, Keuka, Canadaigua, and Conesus Lakes have small, isolated weed problems, but are generally in excellent condition. The most troublesome plants in the Finger Lakes are: Eurasian water milfoil, northern water milfoil (Myriophyllum exalbescens), coontail (Ceratophyllum demersum), water star grass (Heteranthera dubia), Vallisneria americana, and pondweed (Potamogeton spp.). The flora and effects of eutrophication are distinct for each lake, though excessive weed growth is primarily caused by a combination of nutrient availability and heavy sedimentation in shallow areas. Recommended short-term control measures include harvesting of plants in conjunction with carefully controlled herbicide applications. Harvesting also provides long-term benefits through nutrient removal, as does dredging. The most important long-term goal is control of urban sprawl through land-use restrictions. (Lynch-Wisconsin)
W79-00787

ANALYSIS OF ECONOMIC EFFECTS OF ENVIRONMENTAL REGULATIONS ON THE INTEGRATED IRON AND STEEL INDUSTRY. VOLUME I.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 213, Price codes: A18 in paper copy, A01 in microfiche. Publication No. EPA 230/3-77-015A, July 1977. 416 p. 35 fig, 3 tab, 7 append. 68-01-2832.

Descriptors: *Analytical techniques, *Iron and steel industry, *Economic impact, *Costs, *Pollution abatement, *Water pollution control, *Regulation, Water quality standards, Effluent limitations, Emission standards, Planning, Iron, Steel, Air pollution, Model studies, Computer models, Capital costs, Operating costs, Industrial production, Industrial wastes, Economics, Financing, Operation and maintenance, Effluents.

Analysis of the economic impact of environmental regulatons on the integrated iron and steel industry by means of a computer model shows that capital expenditures of $6.8 billion will be required for pollution control between 1975-83, of which $3.6 billion will be allocated to water pollution and $3.2 billion to air pollution control. Annual operating costs are likely to increase less than 2% during the next decade, and costs to steel consumers should increase less than 5%. Capital availability, and impacts on energy, employment, the community, and balance of trade are evaluated. This study is unique in combining a cost impact methodology with a computer-based revenue requirement and external financing methodology which permits integrated analysis of the economic impact of environmental regulations. A policy testing model, PTm (Steel), combines planning assumptions of industry and technical experts with structural relationships utilized by engineers and accountants. The analysis covers processes from raw materials storage yards for coke ovens and blast furnaces through finishing mills, but excludes production and transportation of raw materials and fabrication of steel products. An estimated 70% of net fixed assets of major integrated steel companies during the 1972-74 are represented. Environmental requirements are those promulgated, proposed, or anticipated by EPA only. Research methodology is described in detail in Volume II. (Lynch-Wisconsin)
W79-00788

ECONOMIC IMPACT OF A PROPOSED CHANGE IN THE AMMONIA EFFLUENT STANDARDS, R77-6,
Illinois Inst. for Environmental Quality, Chicago.
L. Huff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 992, Price codes: A05 in paper copy, A01 in microfiche. IIEQ Document No. 77/18, June 1977. 88 p, 7 fig, 27 tab, 14 ref, 3 append. 80.094.

Descriptors: *Regulation, *Water quality standards, *Illinois, *Effluent limitations, *Economic impact, *Cost-benefit analysis, Ammonia, Economics, Effluents, Limiting factors, Streams, Rivers, Water pollution control, Treatment facilities, Waste disposal, Waste water treatment, Water quality control, Environmental Protection Agency, Municipal wastes, Industrial wastes.

The Illinois Environmental Protection Agency (IEPA) has petitioned the Pollution Control Board to consider its proposed regulation R77-6 ('ammonia effluent standards date revision') which relaxes enforcement of Rule 402 of the Water Pollution Regulations regulating ammonia effluents into Illinois Rivers. This report, which evaluates the economic impact, costs, and benefits of both enforcing and relaxing the rule, recommends that the proposal is justified, and that public economic impact hearings be held. The exceptions would temporarily release small operations from expensive and complex treatment requirements and provide additional time for larger dischargers to gain compliance. The following amendments are proposed: (1) any source in existence as of 1 April 1977 with an untreated ammonia load less than 60 pounds/day will be exempt from providing specific ammonia nitrogen control; (2) other dischargers would not be required to achieve an effluent quality better than 4.0 mg/liter ammonia nitrogen (November-March) when Rule 203 is being violated by 31 December 1978; and (3) these exemptions would terminate on 1 July 1981. IEPA believes that it would be a technological and economic hardship for municipal waste treatment plants to be required consistently to maintain an effluent as low as 1.5 mg/liter ammonia; these amendments are designed to alleviate the compliance problem of several hundred such municipalities who might otherwise lose state or federal funding, and also assists small private dischargers who cannot afford compliance. (Lynch-Wisconsin)
W79-00789

THE UNITED KINGDOM MARKET FOR AIR AND WATER PURIFICATION AND POLLUTION CONTROL EQUIPMENT,
Planning Research and Systems, Ltd., London (England).
Available from the National Technical Information Service, Springfield, VA 22161 as DIB-77-10-515, Price codes: A02 in paper copy, A01 in microfiche. Report DIB-77-10-515, May 1977. U.S. Department of Commerce, Domestic and International Business Administration. 84 p. 16 tab, 5 append.

Descriptors: *Forecasting, *Pollution abatement, *Equipment, Demand, *United Kingdom, *Marketing, United States, Economics, International trade, Export, Import, Air pollution, Monitoring, Water pollution control, Solid wastes, Water purification, Sewage treatment, Effluents, Instrumentation.

The market for pollution control equipmet in the United Kingdom, which remained static 1974-76k, is expctd to grow 2-3% per year 1977-78. Projections for 1976-80 indicate the market for water purification equipment will grow 2% annually, and air treatment equipment by 5%. Due to slow recorvery of the British economy, expenditures for water and effluent treatment equipment have declined 1974-76; spending by local water authorities has decreased as much as 20% as aresult of government cutbacks. Of the 1976 market, valued at $327.7 million, 48% ($157.3 million) was spent on water purification and sewage effluent treatment, 26% ($83.9 million) on particulate ad gaseous air pollution control equipment, 21% ($69.2 million) on solid waste disposal, and 6% ($17.3 million) on ar and water monitoring. U.S. equipment accounted for a sizeable share (26-28%) of the British improt market for pollution control equipment 1974-78, particularly in monitoring and air pollution control, with the strongest competition from Germany and Sweden. The U.S. share of the total U.K. pollution control market is likely to be slightly less than 20% by 1980. The British government is the largest end user, consuming about 38%. A list of U.S. products with the highest sales potential is provided. (Lynch-Wisconsin)
W79-00790

ECONOMIC IMPACT OF PROPOSED THERMAL DISCHARGE STANDARD FOR LAKE SANGCHRIS,
Oberlin Coll., OH.
R. M. Wolff, E. L. Hardin, Jr., and M. Friedman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 981, Price codes: A05 in paper copy, A01 in microfiche. IIEQ Document No. 76/25, Dec. 1976. 66 p, 4 fig, 16 tab, 11 ref. 5 app.

Descriptors: *Economic impact, *Lake Sangchris(IL), *Thermal pollution, *Electric powerplants, *Environmental effects, *Effluent limitations, Illinois, Kincaid Station Electric Generating Plant(IL), Artificial lakes, Impoundments, Regulation, Cooling water, Heated water, Costs, Alternative costs, Water pollution control, Water quality standards, Cost-benefit analysis, Cooling towers, Rates, Electric power costs.

This report evaluates a thermal discharge standard(Illinois Water Pollution Regulations) proposed by Commonwealth Edison for its Kincaid Station steam electric generating plant, which discharges heated effluent into Lake Sangchris, an impoundment of three branches of Clear Creek, Christian County, Illinois. The proposed standard (Regulation R76-11) specifies that discharge to Lake Sangchris: (1) shall not exceed 99 F during more than 7% of the hours in a 12-month period, ad (2) shall at no time exceed 111 F. It isconcleded that both economic and environmental considerations favor the proposed standard, although there is considerable doubt about enironmental effects of temperatures above 107 F, the highest so far recorded, and the probable frequency of such temperature excursions. The proposal is submitted in accordance with Regulation R75-2 which allows exemption of man-made cooling lakes from the general thermal discharge standard prohibiting a rise of more than F above ambient water temperature, not to exceed 90 F April-November and 60 F the rest of the year. At 107 F there is no apparent environmental damage. Power consumers would not be directly affected by forcing the plant to reduce its load, but replacement generating capacity would involve a 4.6-fold cost increase. Limiting maximum temperature to 99 F would probably result in plant operation at reduced thermal efficiency. Off-stream colling requires additional energy, and cooling towers are not economically feasible. (Lynch-Wisconsin)
W79-00792

NON-AGRICULTURAL LAND USE AND DESERTIFICATION,
Department of Environment, Housing and Community Development, Canberra(Australia).
For primary bibliographic entry see Field 4A.
W79-00806

OCEAN DESERTS AND OCEAN OASES,
Jaycor, Alexandria, VA.
J. D. Thompson.
Climatic Change, Vol. 1, p 205-230, 1978. 2 fig, 2 tab, 86 ref.

Descriptors: *Oceanography, *Marine biology, *Fish conservation, *Aquatic environment, Biological communities, Water pollution sources, Variability, Ocean currents, Coasts, Upwelling, Fish management, Fish farming, Fish populations, Aquiculture, Fishing.

Desertification is frequently discussed and studied in terms of losses of biological productivity on land. Not as well known or studied, however, is the serious problem of desertification in our seas. While the land may suffer from overgrazing, the seas frequently experience overfishing; as the land can experience weather changes affecting agricultural productivity, the seas experience changes in currents and thermal structure producing dislocation of fisheries; and as land can be used for variable purposes, the sea is frequently used as a dumping pit for mining and other uses incompatible with the maintenance of its natural ecosystem. Additionally, although various pollutant cause considerable destruction on land, the sea is often the ultimate sink for most of them. Surprising to most people is the fact that 90% of the world's ocean area is desert in a biological sense. Documented and discussed in this article is the thesis that the sea is susceptible to severe losses of biological productivity due to natural and anthropogenic factors. While most of the sea is biologically a desert, the areas of high productivity are concentrated in the coastal zones closest to man's pollution. Coastal upwelling zones account for one-half of the world's fish harvest but comprise only .1% of the ocean surface and have been heavily over exploited. Natural variability of the ocean's climate, overfishing, and pollution emerge from this analysis as the principal factors causing the serious desertification of our oceans. (Tickes-Arizona)
W79-00817

TREATMENT CONTROL APPARATUS FOR WATER SYSTEMS,
For primary bibliographic entry see Field 5F.
W79-00820

SEQUESTERING OF CA++ AND MG++ IN AQUEOUS MEDIA USING ZEOLITE MIXTURES,
Union Carbide Corp., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W79-00851

AN EXPERIMENTAL STUDY OF FLOW AND OXYGEN TRANSFER IN CIRCULATION INDUCED BY AIR BUBBLE PLUMES,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2E.
W79-00856

WILDERNESS WATER QUALITY: BISHOP CREEK BASELINE STUDY, 1974,
California Univ., Los Angeles. Environmental Science and Engineering.
R. K. Kawaratani, and R. L. Perrine.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 353, Price codes: A11 in paper copy, A01 in microfiche. California Water Resources Center, Contribution No. 150, June, 1975. 231 p, 90 fig, append. (California Water Resources Center Project UCAL-WRC-W-489).

Descriptors: *Baseline studies, *Monitoring, Water quality control, *Water quality standards, California, *Bishop Creek(Calif), Pollutant identification.

The overall objective of this study program is to develop water quality test methods, either adaptations of established, standard methods or entirely new methods which might be needed, for continuing water quality monitoring and protection in prime, remote recreation-watershed areas. Both chemical and bacteriological contaminants or stream contents are to be studied. The need to detect or to anticipate possible short-term increases in contaminants is emphasized. The relationship of water quality variations to local use and local geological and hydrological features also must be noted. All work has been conducted with the cooperation and guidance of appropriate state and federal agencies. The objective of the specific program of research, which is the subject of this report has been to establish a firm baseline for the continuing effort. Thus the current work is comprehensive, and is also detailed considering the anticipated scope of the entire study.
W79-00859

ENVIRONMENTAL DATA MANAGEMENT: THE IDENTIFICATION OF OUTLIERS,
Kentucky Univ., Lexington. Dept. of Economics.
J. R. Marsden, D. E. Pingry, and A. B. Whinston.
Journal of Environmental Economics and Management, Vol. 3, p 154-163, 1976, 1 fig, 2 tab, 10 ref. OWRT-A-031-IND(4).

Descriptors: *Data processing, *Data Storage and Retrieval, Basic data collections, Water quality standards, Federal Water Pollution Control Act, *Data outliers, Data verification, Data reliability, Data management system.

Increased emphasis on pollution control and abatement has often necessitated development of large scale data bases. While sophisticated techniques have been developed and employed for data storage and manipulation, parallel developments in analyzing the accuracy and reliability of the data have been absent (see, for instance, the broad spectrum of requirements outlined in the Federal Water Pollution Control Act Amendments of 1972). This paper centers on the latter and sets out a procedure for data editing and 'outlier' indentification based on an application of discriminant analysis. A hypothetical example is included along with some suggested applications.
W79-00863

OPTIMAL CONTROL OF COOLING WATER DISCHARGE FROM A POWER PLANT,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
J. T. Tseng, L. T. Fan, and C. L. Hwang.
IEEE Transactions of Systems, Man, and Cybernetics, Vol. SMC-4, No. 6, p 523-531, November 1974. 4 fig, 1 tab, 33 ref. OWRT B-030-KAN(8), 14-31-0001-3592.

Descriptors: Water quality control, Thermal pollution, *Cooling water discharge, Optimal control, Powerplants, Maximum principle, Direct search.

The optimal cooling water discharge policy from a power plant to a stream has been studied for the purpose of preventing thermal pollution. The control policy has been obtained by means of the maximum principle and also by means of a direct search technique. The optimal policy permits a power plant to operate at the highest possible capacity and at the same time to maintain a high water quality. The policy depends on the relative weight between water quality represented by the dissolved oxygen (DO) distribution and power generation represented by the cooling water discharge rate. The transient temperature, DO, and biological oxygen demand (BOD) profiles corresponding to the optimal policy have also been determined.
W79-00870

USER'S MANUAL FOR PREMINING PLANNING OF EASTERN SURFACE COAL MINING, VOLUME I: EXECUTIVE SUMMARY,
Pennsylvania State Univ., University Park. Dept. of Mineral Engineering.
R. V. Ramani, and M. L. Clar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 086, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/7-78-180, August 1978. Vol I of VI, 81 p, 6 fig, 4 tab, 5 append. EPA R803882.

Descriptors: *Premining planning, *Coal mines, *Mining, *Mine engineering, *Water management(Applied), *Reclamation, *Environmental effects, Hydrology, Geology, Mine drainage, Land use, Land reclamation, Planning, Comprehensive planning, Data collections, Regulation, Law enforcement, Legislation, Permits.

A study on surface mining of coal in the Eastern U.S. was initiated for the purpose of establishing guidelines for developing, evaluating, and selecting the least environmentally detrimental mining and reclamation practices. Scope was limited to three major areas: surface mine engineering, including geological and hydrological settings as essential to premining planning; water management; and land-use planning. This volume, the first of six, provides a summary of the major areas to be covered in the project, with outlines of the other five which are devoted to surface mine engineering, geology of Eastern coalfields, mine hydrology, mine drainage management and monitoring, and mine land planning. Appendices provide a survey of state and Federal strip mine regulations in the Eastern and Midwestern coal producing states, a list of state surface mine reclamation control laws and responsible agencies, a list of EPA manuals related to environmental control for surface coal mining, and a list of major functions of the Office of Surface Mining Regulation and Enforcement. Also included are examples of typical data required from companies applying for a mining permit. (Majtenyi-IPA)
W79-00877

DOMES UPPER WATER PHYSICAL OCEANOGRAPHY, A COMPONENT OF THE DOMES PROGRAM,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W79-00885

DISTRIBUTION AND COMPOSITION OF THE SUSPENDED PARTICULATE MATTER IN THE WATERS OF THE DOMES REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W79-00886

TRACE METAL BASELINES IN THE DOMES STUDY AREA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-00887

STUDIES ON THE EFFECTIVENESS OF THE GUPPY POECILIA RETICULATA IN CONTROLLING CULEX PIPIENS S.L.: II. EFFICIENCY OF PREDATION IN BREEDING HABITATS, (IN JAPANESE),
Dep. Parasitol, Sch. Med., Teikyo Univ., Kaga, Itabashi, Tokyo, Jap.
T. Kurihara, and M. Sasa.
Jap J Sanit Zool. 24(1), p 79-82, 1973.

Descriptors: Age, Breeding, *Culex-pipiens, Culex-pipiens-pallens, Guppy, Habitats, Japan,

*Poecilia-reticulata, Predation, Water pollution control.

Experiments were carried out with 2 guppies in tanks placed outdoors under natural summer condition of Tokyo (Japan); water temperature was around 25-27C Five egg rafts of C. pipiens pallens were given each morning for 7 days. Each egg raft contained an average of 249 eggs. The number eaten was estimated at 3 rafts/day. Some of the larvae had hatched from the eggs, but it was difficult to estimate the number which did because of their small size. No larvae were found on the 8th morning. To determine the number of larvae of different developmental stages which was eaten per day, various stage of larvae were introduced in each tank. When 2000 larvae, which had recently hatched from eggs were supplied, 369 of them had pupated after 6-10 days. In the control tank, where there were no guppies, 1614 larvae survived and pupated. It was estimated that 386 of the original 2000 larvae in the control tank died naturally. If it is assumed that an approximately equal number of larvae will die naturally in the experimental tank, then the actual number of larvae consumed was estimated at 1245, or (2000-369)-(2000-1614), during the larval period. When 50 larvae of age 3 days after hatching were supplied in the same way as mentioned above, the number of larvae eaten was estimated at 249 larvae by the end of the pupation period; under similar conditions, 142 four-day larvae were consumed; 50 five-day larvae; and 35 six-day were eaten. From the above, the number of larvae eaten per day was calculated in the case of 0-2 days old larvae as: (1245-249)/3=332 larvae. In the same way, 107 three-day old larvae, 92 four-day and 15 five-day old larvae were eaten per day. When a mixed-age population of larvae were supplied, the number eaten was greater in younger-aged larvae than older ones. Some older ones were always eaten in spite of the presence of young larvae still remaining in the tank, although the number of older larvae consumed was less in comparison when a homogeneous age-group ralulation was available. (See also W75-04382)--Copyright 1974, Biological Abstracts, Inc.
W79-00889

STUDIES ON EFFECTIVENESS OF GUPPY POECILIA RETICULATA IN CONTROLLING CULEX PIPIENS S.L.: III. FIELD EVALUATION OF CONTROL METHODS USING GUPPY LARVICIDE, OR GUPPY-LARVICIDE, (IN JAPANESE),
Dep. Parasitol., Sch. Med., Teikyo Univ., Kaga, Itabashi, Tokyo, Jap.
T. Kurihara, K. Hata, and M. Sasa.
Jap J Sanit Zool. 24(1), p 83-88, 1973.

Descriptors: *Culex-pipiens, Culex-pipiens-pallens, Fenitrothion, Guppy, *Larvicides, Methods, Oviposition, *Poecilia-reticulata, Rafts, Water pollution control.

Four tanks, labeled A, B, C, and D, containing 750 l of water, were placed outdoors near the laboratory. Breeding of C. p. pallens was found in each tank in early June, 1972. Twenty guppies, or 10 mature pairs, were introduced in 2 of the tanks, B and C, on 9 June 1972. Tank B was then treated with fenitrothion 1 ppm, tank C remained untreated. Tank D was treated with fenitrothion 1 ppm on the same day, and tank A, the control tank, received neither guppies nor fenitrothion. The observation for each tank was conducted using a ladle to count the larval and pupal densities every 2 or 3 days. Also counts of total number of egg rafts on the water surface were made on the same day. These observations were made until the end of Sept. Larvae and pupae dramatically disappeared on the 4th day after fenitrothion treatment in both tanks B and D. In the case of tank D, the chemical treatment had to be repeated 5 times during a 2-mo. period due to the outbreak of larvae every 10 or 20 days. Tank B, however, received no additional chemical treatment after the initial treatment because of the presences of the guppies. A number of pupae was observed for 3 wk after introduction of guppies to tank C, but all pupae had disappeared by the end of this period. More than 100 rafts a day of oviposition were observed in tanks A and D. However, no rafts were recognized from tanks B and C, except for very few days during the peak time of oviposition activity of mid-summer. As Part II of the present report series showed, these egg rafts were eaten by guppies in each tank. Thus, in tanks B and C no adult mosquitoes emerged throughout the summer season. (See also W75-04382)--Copyright 1974, Biological Abstracts, Inc.
W79-00890

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W79-00896

THE EFFECTS OF TEMPERATURE ON THE GROWTH AND SURVIVAL OF LARVAL AND JUVENILE CRAYFISH, PACIFASTACUS LENIUSCULUS,
California Univ., Davis. Dept. of Animal Science.
For primary bibliographic entry see Field 5C.
W79-00909

PRINCIPLES OF WATER RESOURCES PLANNING (PHASE II),
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-00913

THE EFFECTS OF IRRIGATION RETURN WATER ON AQUATIC PLANTS (PERIPHYTON) IN THE SACRAMENTO RIVER AT KNIGHTS LANDING, CALIFORNIA,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5C.
W79-00914

MISSISSIPPI WETLANDS PROTECTION PRACTICE AND PROCEDURE.
Mississippi Univ. Law Center, University.
For primary bibliographic entry see Field 6E.
W79-00927

OIL POLLUTION CONTROL MECHANISMS - STATUTES AND REGULATIONS.
Mississippi Univ. Law Center, University.
Mississippi/Alabama Sea Grant Consortium Report No. MASGP-78-014, April 1978. 73 p, 2 append. SG-04-7-158-44017.

Descriptors: *Oil pollution, *Legislation, *Oil spills, Water pollution control, Pollution abatement, Pollution prevention.

The purpose of this analysis is to provide a detailed picture of federal statutes and regulations, as well as case law, bearing on oil spill prevention and control. Emphasis has been placed on federal action occurring after a spill, although some effort is directed toward review of prevention statutes and regulations. In-depth consideration is given the control of oil pollution under the Federal Water Pollution Control Act but this analysis also touches lightly upon acts that have a lesser effect on oil pollution control. These acts being: The Refuse Act, the Ports and Waterways Safety Act of 1972, the Outer Continental Shelf Lands Act, the Oil Pollution Act of 1961, the Deepwater Port Act of 1974, and the Fish and Wildlife Coordination Act. (NOAA)
W79-00928

CRISIS SCIENCE: INVESTIGATIONS IN RESPONSE TO THE ARGO MERCHANT OIL SPILL,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5C.
W79-00929

EVALUATION OF AN AIR BUBBLER TO MITIGATE FISH IMPINGEMENT AT AN ELECTRIC GENERATING PLANT,
Texas Instruments Inc., Buchanan, NY.
J. T. Lieberman, and P. H. Muessig.
Estuaries, Vol. 1, No. 2, p 129-132, 1978. 4 tab, 15 ref.

Descriptors: *Entrainment, *Thermal powerplants, *Fish behavior, Cooling water, Animal behavior, Water chemistry, Water analysis, On-site data collections, Intakes, Outlets, Fish barriers, Pumps, Striped bass, White seaperch, Statistical methods, *Impingement, Air bubbler.

To determine whether fish impingement at an electric generating plant was significantly reduced during the operation of an air bubbler, impingement monitoring data was subjected to statistical analysis. Daily impingement rates were calculated for total fish collections and for three impinged species, and associated with water chemistry conditions and air curtain operation during impingement periods. Analysis for each species by season indicated that the air curtain was not an effective fish deterrent.
W79-00950

TAMANO OIL SPILL IN CASCO BAY: ENVIRONMENTAL EFFECTS AND CLEANUP OPERATIONS.
Environmental Protection Agency. Washington, DC. Spill Prevention and Control Board.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 950, Price codes: A11 in paper copy, A01 in microfiche. Environmental Protection Agency, EPA-430/9-75-018, 284 p, December 1975. 53 fig, 12 tab, 2 app, 13 ref.

Descriptors: *Oil, *Oil spills, *Oil pollution, Organic compounds, Path of pollutants, Water pollution effects, Biological communities, Bottom sediments, Littoral, Beaches, Benthic flora, Benthic fauna, Gulls, Water birds, Chemical analysis, Chromatography, Clams, Lobsters, Environmental effects, Maine, *Tissue analysis, Casco Bay, Maine.

This study was undertaken to determine the effects of no. 6 oil on marine communities of Casco Bay, Maine and to assess the effectiveness of containment and cleanup operations. Areas studied included rocky intertidal, intertidal mud, and subtidal benthic. Comparable control stations were chosen at Bailey Island and Orrs Island. Stations were analyzed for density and diversity of species as an indicator of stress. Sediments and selected biota were analyzed for No. 6 oil by gas chromatography. Results showed contamination at all stations, even those chosen as controls, indicating that the ultimate disposition of the oil did not correspond to sightings of surface slicks immediately following the spill. (EIS-Deal)
W79-00983

ELEOCHARIS ACICULARIS (L) R AND S: THE AUTECOLOGY OF AN ACID TOLERANT SEDGE,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-00984

WASTEWATER MANAGEMENT ALTERNATIVES FOR THE SHELLFISH PROCESSING INDUSTRY,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
F. G. Pohland, and J. W. Hudson.
Georgia Marine Science Center, Sea Grant Program Technical Report Series No. 78-2, April 1978. 133 p, 45 fig, 20 tab, 44 ref, append.

Descriptors: *Georgia, *Waste water treatment, Food processing industry, *Shellfish processing industry, Management, Alternative planning, Water pollution control.

Laboratory studies were conducted at the Sanitary Engineering Laboratories of the Georgia Institute of Technology to establish the technical applicability of various wastewater tratment methods for shellfish processing waste discharges. The relative economies associated with the implementation of various selected wastewater management alternatives were also estimated and compared. Physical-chemical treatability applications included chemically aided coagulation-flocculation, activated carbon adsorption, ion exchange and sand filtration. biological modes for wastewater stabilization consisted of aerobic slurry (activated sludge-type) treatment, single-stage and recycle contact anaerobic treatment, rotating biological contactors, and anaerobic packed bed columns. (NOAA)
W79-00995

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF REAL-TIME HOURLY OPERATIONS OF A COMPLEX, MULTIPLE PURPOSE RESERVOIR SYSTEM,
California Univ., Los Angeles. School of Engineering and Applied Science.
W. W-G. Yeh, L. Becker, and W-S. Chu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 356, Price codes: A10 in paper copy, A01 in microfiche. Report No. UCLA-ENG-7807, February 1978. 194 p, 13 fig, 12 tab, 79 ref, append. OWRT C-7099(No. 6209)(1), 14-34-0001-6209.

Descriptors: *Optimization, *Multiple purpose reservoirs, *Computer models, *Computer programs, *Reservoir operation, *Hydroelectric power, *Reservoir releases, Reservoir management, Water management(Applied), Model studies, Flow control, Simulation, Dynamic programming, Linear programming, Scheduling, Water utilization, Optimum development plans, Management.

The development of an hourly optimization model for on-line use in operating the Central Valley Project (CVP) in California is described. The procedures used for optimization of CVP, a complex multiple purpose reservoir system, are applicable to other water resource systems with appropriate changes in program details. The hourly program maximizes a weighted summation of generated power over a 24-hour period subject to specified plant releases obtained from a daily program, a desired hourly power schedule, and appropriate system and equipment restraints. The first phase of development involved determination of a good feasible policy (a set of releases) through an iterated linear programming and adjust process. The second phase of development used this feasible policy as a starting policy in an incremental dynamic programming, successive approximations process to derive an optimal policy. CVP operational records of some typical days were compared with program outputs for these days and significant improvements were observed, both better conformance with the power schedule desired by the Pacific Gas and Electric Co., and more efficient hydropower production. (Majtenyi-IPA)
W79-00501

STATISTICAL AND STOCHASTIC ANALYSES OF SYNTHETICALLY GENERATED URBAN STORM DRAINAGE QUANTITY AND QUALITY DATA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
G. Padmanabhan, and J. W. Delleur.
Available from National Technical Information Service, Springfield, VA 22161 as PB-288 355, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 108, July 1978. 111 p, 40 fig, 26 tab, 46 ref. OWRT C-6106(No. 5213)(4).

Descriptors: *Urban drainage, *Drainage systems, *Planning, *Water quality, Storm water, Storm drains, Management, Simulation analyses, Data collections, *STORM, *ILLUDAS.

This report deals with an analysis of the synthetic data generated by the urban runoff model 'STORM' using 21 years of hourly precipitation on the Upper Ross-Ade Watershed for long-term planning purposes. This approach is an alternative to 'design storm' approach for planning stormwater quantity and quality management. This has the additional justification in the fact that the synthetic data reflect the integrated effect of storms in the context of storage and treatment capacities of the system. Furthermore, simulation and synthetic generation of data is perhaps the only solution for obtaining long-term characteristics of quality because of the scarcety of observed quality data for long periods. A statistical analysis on 'events' generated by 'STORM' is performed to obtain long-term statistics of quantity and quality of stormwater. Also attempted, are the development of regression relationships, frequency-duration relationship of 'events' and 'time series' analysis of monthly series of rainfall, runoff, suspended solids and BOD of events. The results seem to justify the desirability of this type of analysis. Also demostrated is the usefulness of combined use of 'STORM' along with 'ILLUDAS' to provide necessary input for the economic analysis of stormwater management system.
W79-00521

ENVIRONMENTAL IMPACT COMPUTER SYSTEM ATTRIBUTE DESCRIPTOR PACKAGE, REFERENCE DOCUMENT.
Construction Engineering Research Lab., Champaign, IL.
For primary bibliographic entry see Field 7A.
W79-00652

METHODS TO EFFECT COST REDUCTIONS IN MUNICIPAL WATER SYSTEMS,
Mississippi Univ., University Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6C.
W79-00678

DECISION THEORY APPLICATIONS AND IRRIGATION OPTIMIZATION,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W79-00857

ENVIRONMENTAL DATA MANAGEMENT: THE IDENTIFICATION OF OUTLIERS,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-00863

6B. Evaluation Process

PROBLEM-RESEARCH ANALYSIS IN THE U.S. VIRGIN ISLANDS INSULAR REGION, ATLANTIC SUBREGION,
College of the Virgin Island, St. Thomas. Caribbean Research Inst.
A. E. Pratt, and T. M. Vaughan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 042, Price codes: A03 in paper copy, A01 in microfiche. Virgin Islands Water Resources Research Center, Technical Report No. 1, February 1978. 23 p, 1 tab, append. OWRT B-001-VI(1), B-001-VI.

Descriptors: *Water resources, *Virgin Islands, *Water supply, *Conservation, *Analysis, Water quality, Water resources development, Water management(Applied), Conferences, Water quality control, Waste treatment, Recycling, Water treatment, Surveys, Data collections.

A problem-research analysis was carried out to identify the major researchable water problems in the U.S. Virgin Islands and to establish a rank of importance of urgency in the problems identified. This was done using a questionnaire distributed to persons considered to have an interest or involvement in water resources and also using three workshops which discussed the problems of meeting the increasing demands on the Islands' water resources and the role of research in solving the more urgent needs. The most severe water-related problems were condensed into four major categories: (1) alternatives in water supply; (2) conservation and water re-use; (3) water quality and waste management; and (4) social, economic, and institutional problems in water resources planning and management.
W79-00511

THE ECONOMIC REALITIES OF DROUGHT,
C. E. Harshbarger, and M. Duncan.
Federal Reserve Bank of Kansas City Monthly Review, May 1977, p 3-13. 2 fig, 9 ref.

Descriptors: *Droughts, *Economics, *Agriculture, *Crop production, *Income, *Debt, Farm management, Water shortage, Great Plains, Pacific Coast region, California, History, Wheat, Real property, Farms, Policy, Loans, Banks, Prices, Equity.

The economic effects of drought on agriculture are discussed from the perspective of severe water shortages in the southern Great Plains and the Pacific Coast region since 1973. The analysis is especially geared to the Tenth District of the Federal Reserve System (Nebraska, Kansas, Oklahoma, New Mexico, Missouri, Colorado and Wyoming). Wheat production for the U.S. and the Tenth District is given in charts for 1928-37 and 1947-56; it is noted that drought rarely leads to sharp rises in retail food prices in the short run. The aggregate farm balance sheet indicates a healthy and profitable agricultural industry, with an increase in the value of all farm assets from $281 billion in 1968 to $634 billion in January 1977. In constant dollars this represents a gain of about 27%. Net farm income increased from $12.2 to $24 billion over the same period, and per capita disposable personal income of farmers as a percentage of nonfarm income was 89.5% in 1975, compared with 47.7% in 1956 and the peak of 109.3% in 1973. However, persistence of the drought for another year or two in the grain belt and far west would have serious consequences for the nation. In addition, despite very favorable grain prices in the mid-1970s, the substantial gains in farm assets and proprietor's equities depended heavily on borrowed capital; total farm debt in January 1977 was $101.5 billion. A substantial number of recent entrants into farming having low equity could be forced out of business as a result of prolonged income reductions. Various farm policy alternatives are discussed, with emphasis on loans. (Lynch-Wisconsin)

W79-00582

MARKET IMPERFECTIONS AND THE OPTIMUM RATE OF DEPLETION OF NATURAL RESOURCES,
For primary bibliographic entry see Field 6C.
W79-00583

THE EXPLOITATION OF EXTRACTIVE RESOURCES: A SURVEY,
F. M. Peterson, and A. C. Fisher.
The Economic Journal, Vol. 87, December 1977, p 681-721. 5 fig, 248 ref.

Descriptors: *Resource depletion, *Natural resources, *Reviews, *Economics, *Extractive resources, *Bibliographies, Exploitation, Optimization, Renewable resources, Model studies, Non-renewable resources, Welfare(Economics), Resource allocation.

A critical and analytical comprehensive literature survey is presented of natural resource extraction, especially models of optimal exploitation and studies of long-run resource depletion. A 248-entry bibliography is included. The first section on renewable resources covers: (1) a model of renewable resource use (Schaefer 1954, 1957), (2) the common property problem, and (3) extensions and empirical applications of the model associated with Schaefer. The section on nonrenewable resources includes: (1) static approaches to the theory of the mine; (2) a dynamic model; (3) extensions of the dynamic model (monopoly, exploration, uncertainty, and recycling; (4) the optimal rate of use; (5) intergenerational welfare; and (6) the potential exhaustion of natural resources. Two major conclusions emerge: (1) competitive markets allocate extractive resources about as well as they do other resources, and (2) though stocks are being physically depleted, erosion of the economy's resource base has been prevented by technical change, economies of scale, and product and factor substitution. In terms of sacrifices required to obtain extractive commodities, the latter have actually become less scarce over the past century. Nevertheless, with common property resources such as fisheries, either sole ownership or unitized management must be imposed to counteract overexploitation. Maximum sustainable yield will usually not be optimal, however. Other problems involve marginal user cost, relative prices of metals and fuels, external costs, and future uncertainties. (Lynch-Wisconsin)
W79-00584

OPTIMUM DEPLETION OF NATURAL RESOURCES: SOME GENERAL ISSUES,
Kansas Univ., Lawrence. Inst. for Social and Environmental Studies.
D. S. Dendrinos
Socio-Economic Planning Sciences, Vol. 11, No. 4, 1977, p 233-234. 9 ref.

Descriptors: *Natural resources, *Environmental economics, *Economics, *Optimization, *Resource depletion, *Welfare(Economics), Theoretical analysis, Equity, Opportunity costs, Social values, Discount rates, Social impact, Cost-benefit analysis

An analysis of equity issues in choosing optimal levels of resource depletion for present and future generations concludes that we should do now what is best now and that because of environmental planning uncertainties, planning time spans should be limited to the near future. Articles by Slow (1974) and Kay and Mirrlees (1975) are used as a basis for discussion. Published studies tend to show that market conditions will deplete a resource at an optimal rate if social marginal rates of substitution between opportunity costs of conserving or extracting the resource are equal to resource prices over time. Kay and Mirrlees hold that the extraction rate of the natural and non-reproducible resource, which results in the maximum present value of the discounted profits from exploiting the resource, also results in the maximum value of a social welfare function as defined by the sum of social utilities over time. Solow examines the impact of the Rawlsian criterion of maximizing the minimum level of social welfare incurred over time and shows that use of such a criterion for social optimization is inappropriate as it tends to perpetuate poverty. The main point in the literature is that the market rate of interest is a built-in stabilizer in the economy which regulates resource depletion at its socially optimum level. One questionable underlying assumption is that resource owners have perfect foresight concerning future prices, and can ascertain how much future generations will be willing to pay for a resource.
W79-00587

THE RELATIONSHIP BETWEEN COASTAL-ZONE MANAGEMENT AND OFF-SHORE ECONOMIC DEVELOPMENT,
Southampton Univ. (England). Dept. of Geography.
M. J. Clark.
Maritime Policy and Management, Vol. 4, No. 6, November 1977, p 431-449. 5 fig, 15 ref.

Descriptors: *Water management, *Water resources development, *Exclusive economic zne, *Coastal zone management, *Continental shelf, *United Kingdom, Coasts, Economic development, Oil industry, Economics, Law of the sea, Legislation, International agreements, Decision making, Planning, Policy, Offshore zone.

Comparative analysis of the exclusive economic zone (EEZ) proposed for international sanction and the coastal zone shows interrelationships sufficiently strong to justify referring to the latter in international EEZ conventions, national EEZ implementing legislation, and management planning. Economic development of the outer cntinental shelf, such as exploitation of North Sea oil, represents potentially massive impact on economic, social, and environmental systems, and poses a serious challenge to the coastal planning system. Establishment of an exclusive economic zone could further complicate such planning through encouraging accelerated exploitation of offshore resources, but could also offer a means of management improvement through international conventions and national legislation. It is doubtful that a single comprehensive legislative or planning mechanism could satisfy all requirements; separate frameworks for coastal and offshore decision-making would probably be necessary. However, statutory joint consultation and mutual monitoring would be essential. This paper discusses: (1) coastal zone management process, (2) biophysical and socioeconomic systems, (3) perception as a prelude to decision-making, (4) relationship between management and biophysical attributes, (5) strategies and criteria for decision-making, (6) coastal zone inputs to continental shelf planning, and (7) legislation and management procedure. (Lynch-Wisconsin)
W79-00593

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A COMMENT (SMITH),
Resources for the Future, Inc., Washington, DC.
V. K. Smith.
KYKLOS, Vol. 30, No. 2, 1977, p 310-313. 10 ref.

Descriptors: *Cost-benefit analysis, *Policy, *Economics, *Environmental economics, Pollutants, Irreversibility, Pollution abatement, Externalities, Uncertainity, Resource allocation, Welfare(Economics), Optimization, Theoretical analysis, Dynamics, Discount rates.

This paper rebuts Pearce's 1976, (see W77-04561) conclusion that cost-benefit techniques have limited relevance where pollutant discharge rates exceed environmental assimilative capacity since irreversible stocks of these residuals accumulate. Pearce views cost-benefit analysis as static, and concludes that physical information alone will identify a welfare maximum in the case of cumulative pollutants. It is argued here that Pearce's analysis ignores contributions by Fisher, Krutilla, and Cichetti (1967-72) which offer amendments to traditional cost-benefit practices to account for the special character of irreversible allocation decisions. In addition, reliance on strictly biological criteria for defining an economic optimum ignores the relative values of alternative effects associated with each allocation and cannot, except by chance, result in a welfare maximum. Irreversibilities are important inter-temporal externalities which bring costs or benefits to future generations without their consent and without market-determined compensations. Fisher, Krutilla, and Cicchetti (1972) show that if benefits of an action decrease over time relative to benefits from pollution prevention, an optimal policy need only consider the present value of: (1) an immediate once-and-for-all action, and (2) no action. Arrow and Fisher (1974) demonstrate that in the case of an irreversibile action involving cost-benefit uncertainty, expected benefits should be reduced to reflect loss of options. (Lynch-Wisconsin)
W79-00596

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A COMMENT (ELLIOTT AND YARROW),
Newcastle-upon-Tyne Univ. (England).
D. Elliott, and G. Yarrow.
KYKLOS, Vol. 30, No. 2, 1977, p 300-309. 4 fig, 3 ref.

Descriptors: *Cost-benefit analysis, *Environmental economics, *Policy, *Economics, *Mathematical models, Model studies, Optmization, Theoretical analysis, Equilibrium, Dynamics, Externalities, Equations, Pollutants, Pollution abatement, Welfare(Economics), Discount rates.

Pearce's 1976 argument (see W77-04561) that cost-benefit analysis is of limited value in environmental policy-making, and is often unnecessary in any case because optima can be ascertained using physical information alone, is rejected here. It is contended that, in general, an infinite number of ecological equilibria can exist; therefore, physical information is insufficient as a basis for policy formation. Cost-benefit analysis, with certain modifications to incorporate dynamic effects, is a useful conceptual framework for addressing a wide class of pollution problems. A simple model is developed in which a flow of damages (external effects) is generated by a pollution accumulated in the environment. An equation is derived which can be regarded as the dynamic analogue of the static cost-benefit rule: marginal cost of pollution abatement=marginal damage of the flow of pollutant. Three implications demonstrating the critical importance of the discount rate for the optimal path are deduced. Dynamic adjustments are then described, and an extension of the analysis to more complicated problems is illustrated. The overall presentation identifies relevant variables for determining the equilibrium rate of discharge and stock of pollutant, namely, the marginal damage of the stock of pollutant, the discount rate, time lags, and marginal rate of environmental absorption. Several informational difficulties associated with certain pollutants are briefly discussed. (Lynch-Wisconsin)
W79-00597

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A REPLY TO ELLIOTT AND YARROW AND TO SMITH,
Aberdeen Univ. (Scotland). Dept. of Political Economy.
D. Pearce.
KYKLOS, Vol. 30, No. 2, 1977, p 314-318. 11 ref.

Descriptors: *Environmental economics, *Economics, *Discount rates, *Policy, *Cost-benefit analysis, Optimization, Pollution abatement, Pollutants, Equations, Model studies, Mathematical models, Welfare(Economics), Equilibrium, Dynamics, Theoretical analysis.

In this reply to 1976 critiques by Elliott and Yarrow and by Smith of the author's article on limitations of cost-benefit analysis in formulating environmental policy, Pearce first clarifies his suggestion that for some cases of environmental degradation, physical information alone will suffice to identify a long-run optimum; it was not claimed that cost-benefit analysis is frequently not needed. It was stated in the original paper that there exists a class of pollution contexts in which assimilation rate was itself a function of the amount of waste, and that some of these contexts necessarily generated an incompatibility between an ecological equilibrium and the neoclassical welfare optimum. Elliott and Yarrow's model omits the very context that generated the disputed conclusion, namely, that physical information alone may identify an optimum. Three points or questions can be raised: (1) The nature of the welfare function will determine whether the maximum ecological output is compatible with a long-run welfare optimum. (2) Can assimilative capacity in the X delta context adjust in some way to restore compatibility between ecological and economic sectors. (3) Elliott and Yarrow's assertion that the discount rate alters the original conclusions is correct, but discounting may not be appropriate in this context. Regarding Smith's comment, Krutilla and Fisher (1975) indeed demonstrate a relevant modification of cost-benefit analysis, but there remains no reason for blind adoption of discount rates. (see W77-04561; W79-00596 and W79-00597) (Lynch-Wisconsin)
W79-00598

HARBOR AND WATERFRONT DEVELOPMENT PLANNING,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 2L.
W79-00657

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT.
National Oceanic and Atmospheric Administration, Washington, DC. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W79-00658

ASSESSING THE SOCIAL IMPACTS OF OIL SPILLS. PROCEEDINGS OF AN INVITATIONAL SYMPOSIUM.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-00661

ICHTHYOLOGICAL INVESTIGATION OF THE PROTECTED HABITAT OF THE DANUBIAN SALMON (L.) ON THE RIVER TURIEC)CZECHOSLOVAKIA) AND SUGGESTIONS FOR ITS MANAGEMENT, (IN SLOVAK),
Laboratorium Rybarstva a Hydrobiologie, Bratislava (Czechoslovakia).
I. Bastl, J. Holcik, and A. Kirka.
Ab Slov Nar Muz Prir Vedy 21, p 191-224, 1975.

Descriptors: *Alburnoides-bipunctatus, Alburnus-alburnus, Barbus-barbus, Chondrostoma-Nasus, Cobitis-taenia, Cottus-Gobio, *Czechoslovakia, Danubian, Esoc-lucius, Gobio-gobio, Habitats, Hucho-hucho, *Ichthyological studies, Ichthyomass, Leuciscus-cephalus, Leuciscus-leuciscus, Lota-lota, *Management, Noemacheilus-barbatulus, Phoxinus-phoxinus, Rivers, *Salmon, Salvelinus-fontinalis, Thymallus-thymallus, *Turiec River(Czech), Zingel-streber, *River Vah(Czech).

The ichthyological status of the protected habitat of the Danubian salmon in the Turiec River were assessed and some measures for enlargement of population of this fish and for management of the river were given. The study was carried out in the summer and autumn of 1968 using electric shocker, haul seine and angling in 4 localities of the protected stretch of the river. In 1 station quantitative estimation of abundance, ichthyomass and available production was performed in a 150 m stretch blocked by nets. The protected habitat is inhabited by 19 spp. of fish (Barbus barbus, Zingel streber, Thymallus thymallus, Esox lucius, Chondrostoma masus, Salmo trutta m. fario, S. gairdneri irideus, Salvelinus fontinalis, Hucho hucho, Phoxinus phoxinus, Cottus gobio, Leuciscus leuciscus, Gobio gobio, Alburnoides bipunctatus, Cobitis taenia, Noemacheilus barbatulus, Lota lota.) belonging to 8 families. At Moskovec estimated abundance was 12,088 fish weighing 484.72 kg/ha of area and available production was 302.2 kg/ha per yr. It was found that the Danubian salmon is a very rare species in the protected habitat and in the whole river. Due to heavy pollution flowing into the River Vah, the Danubian salmon's population became isolated. During the past 5 decades the population of Danubian salmon in the Turiec River was many times larger. The decrease of population of the Danubian salmon can be accounted for by fishing; the catching of juvenile specimen mistaken for trout; gradual worsening of environmental conditions due to industralization, river regulation and polution; rapidly increasing numbers of anglers, poaching and unsuitable and insufficient planting to fry.--Copyright 1977 Biologica Abstracts, Inc.
W79-00718

ECONOMIC IMPACT OF A PROPOSED CHANGE IN THE AMMONIA EFFLUENT STANDARDS, R77-6,
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W79-00789

ECONOMIC ANALYSIS OF EROSION AND SEDIMENTATION, SEVEN MILE CREEK SOUTHWEST BRANCH WATERSHED,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
M. T. Lee, A. S. Narayanan, and E. R. Swanson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 687, Price codes: A03 in paper copy, A01 in microfiche. IIEQ Document No. 74-80, December 1974. 28 p, 11 fig, 8 tab, 12 ref.

Descriptors: *Sevenmile Creek Watershed (IL), *Watersheds(Basins), *Agriculture, *Crop production, *Cultivation, *Erosion control, Income, Illinois, Soil erosion, Crops, Rotations, Soil conservation, Economics, Farm management, Costs, Contour farming, Terracing, Soil loss, Corn(Field), Soybeans, Pastures.

Economic impact of changes in crop rotation, cultivation systems, and conservation techniques on soil erosion, farm income, and sediment damage was studied in Sevenmile Creek Southwest Branch Watershed in west-central White County, Illinois. The watershed is 60-70% row crops (corn and soybeans) and the rest is wheat and pasture. Short- and long-run effects of seven crop rotations, three cultivation methods (conventional, plow-plant, and chisel plow), and three planting techniques (up and down, contouring, and contouring and terracing) were analyzed. Short-run results (one year) showed that: (1) for all rotations maximum soil loss occurs with up-and-down cultivation, and minimum loss with contouring and terracing, and contouring alone; (2) conventional tillage produces highest soil loss and chisel plow the lowest; (3) highest soil loss (23.01 tons/acre) occurs under continuous corn with conventional tillage and up-and-down cultivation; (4) lowest soil loss (0.23 tons/acre) occurs under W-M-M-M (W=wheat, M=meadow hay) with chisel plow and contouring and terracing; (5) continuous corn produce the maximum net income/acre with all three tillage systems; and (6) the highest net return combination is continuous corn with chisel plow and up-and-down cultivation (58.25/acre). Long-run analysis yields similar results. Continuous corn gives the highest net social income (net farm income combined with cost of sediment damage) under all three tillage systems, and W-M-M-M the lowest. (Lynch-Wisconsin)
W79-00791

BUREAUCRATS VS. VOTERS: ON THE POLITICAL ECONOMY OF RESOURCE ALLOCATION BY DIRECT DEMOCRACY,
Carnegie-Mellon Univ., Pittsburgh, PA. Graduate School of Industrial Administration.
For primary bibliographic entry see Field 6E.
W79-00793

TRADITIONAL LAND USE IN MARGINAL DRYLANDS,
United Nations Environment Programme, Nairobi (Kenya); and Secretariat for International Ecology (Sweden).
For primary bibliographic entry see Field 4A.
W79-00797

A DYNAMIC SIMULATION OF REGIONAL ECONOMIC PERFORMANCE WITH ALTERNATIVE WATER POLICIES,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 409, Price codes: A05 in paper copy, A01 in microfiche. Technical Completion Report, Contribution No. 171, California Water Resources Center, August 1978, 83 p, 5 fig, 44 tab. (California Water Resources Center Project (UCAL-WRC-W-484).

Descriptors: *Water policy, *Computer models, *Water costs, *Water demand, Competing uses, Planning, *Simulation analysis, Model studies, *Regional analysis, *California, *Alternative planning, Alternative water use, Water utilization, *Water allocation(Policy), Prices, Economics.

A dynamic simulation model of the regional economy is developed and applied to seven subregions of the Central California Coastal Region to evaluate the effects of alternative water policies during 1970-1990. The regional model developed has four major sectors: demographic, labor, housing and land, and water. The last three sectors are developed in terms of a market with the underlying demand and supply forces modeled to simulate the market operation. A number of dynamic feedbacks are modeled among the several sectors and markets. Base simulations are run for all seven regions under two alternate water sector scenarios. In one, all water in the region is allocated among users by a single agency using shadow prices with the goal of maximizing net benefits from water use. In the second, a single agency in the same fashion allocates all regional water not pumped by individual users. Comparative policy simulations with these two scenarios are run with alternate water policies including housing restrictions, water supply augmentation, and enforcement of water basin safe yield. Major simulation outcomes with these alternate policies are compared to the base simulations and to each other. Based on the model developed, the results of these preliminary simulations suggest that reliance on the price mechanism for water allocation is the most effective water policy. (Snyder-Calif, Davis)
W79-00854

ECONOMIC BENEFITS TO AGRICULTURE IN THE SAN JOAQUIN VALLEY DUE TO LONG-TERM PREDICTION STREAMFLOW FORECASTING,
California Univ., Los Angeles. Dept. of Engineering Systems
For primary bibliographic entry see Field 3F.
W79-00861

WHAT CONSTITUTES 'BENEFITS' FOR URBAN DRAINAGE PROJECTS,
Shoemaker and Wham, Denver, CO.
W. J. Shoemaker.
Denver Law Journal, Vol. 51, No. 4, p 551-565. 1974. OWRT B-113-COLO(5), 14-31-0001-5059.

Descriptors: *Benefits, Budgeting, Cities, Drainage, Drainage practices, *Drainage programs, *Economic justification, Feasibility, Financial feasibility, Flood plains, *Project benefits, Runoff, *Storm drains, *Cost-benefit analysis, Drainage law, Economic evaluation, Financing, *Urban drainage.

The need for adequate urban drainage and flood control systems in metropolitan areas is clear. However, implementation of such systems is being hindered by hesitancy of local officials to act in light of the statutory requirement that assessments be made according to 'benefits' received, while the meaning of 'benefits' remains undefined. The proposed statutory fefinition of 'benefit' would help to clarify the situation, and its enactment would be a positive step toward encouraging needed urban drainage improvements. The term 'benefits,' for the purpose of assessing a particular property within a drainage district (or special improvement district), may include any one or more of the following: Market value increase; reduced liability; greater use of property; alleviation of health hazards; reduction in maintenance costs; increased convenience; aesthetic or ecological improvements.
W79-00872

VISUAL LAND USE COMPATIBILITY AS A SIGNIFICANT CONTRIBUTOR TO VISUAL RESOURCE QUALITY,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional.
W. G. Hendrix, and J. Gy Fabos.
International Journal of Environmental Studies, Vol 1, p 1-8, 1974. 3 fig, 25 ref. OWRT B-029 MASS(1). 14-31-0001-3897.

Descriptors: *Planning, *Land use, Landscapes, *Visual resource assessment, *Model studies, *Metropolitan Landscape Planning Model.

An alternative to landscape complexity as a measure of visual landscape quality is presented. This alternative is called visual land use compatibility and is defined as the relationship between adjacent land uses. The research described is part of an interdisciplinary project at the University of Massachusetts called the Metropolitan Landscape Planning Model (METLAND). Man's concern for the relationships between land uses is discussed, tracing that concern through history to the present. A procedure that was designed to measure perceptions of the visual aspects of these land use relationships is described. It appears to be valid to extend the concept of 'misfits' into a more general model of both desirable and undesirable aspects of land use relationships. Further research to develop that model is proposed.
W79-00873

USER'S MANUAL FOR PREMINING PLANNING OF EASTERN SURFACE COAL MINING, VOLUME I: EXECUTIVE SUMMARY,
Pennsylvania State Univ., University Park. Dept. of Mineral Engineering.
For primary bibliographic entry see Field 5G
W79-00877

ECONOMIC IMPACT OF FOSSIL ENERGY ALTERNATIVES ON CALIFORNIA IRRIGATED AGRICULTURE,
California Univ., Davis. Dept. of Agricultural Economics.
W. E. Johnston, R. M. Adams, and G. A. King.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 408, Price codes: A03 in paper copy, A01 in microfiche. Contribution 170, Water Resources Center, University of California June 1978. 35 p, 2 fig, 17 tab, 48 ref. (California Water Resources Center Project UCAL-WRC-W-483).

Descriptors: *Energy, *Fuels, *Water costs, *Cost analysis, Economic efficiency, *Economic impact, *Alternative water use, Irrigation, Agriculture, Model studies, Crop production, *California.

Some effects of alternative energy scenarios are analyzed for their short-run impacts on the level of production and the product mix of annual field crops and vegetables in California. The scenarios focus on the impacts of fuel and fertilizer cost increases and reduced supplies through a quadratic programming model of regional production of nine field crops and 28 seasonal vegetable crops. The short-run model considers soil type and water availability as constraints to the problem and in the case of water does not permit alteration in historical regional mixes of surface and ground water. Effects of the use of statewide versus regional energy allocations and of the introduction of an initial measure of producer risk are examined in model results. Price, quantity, acreage, and welfare effects are noted for the alternatives of regional energy allotments, increased energy prices, and statewide reductions in energy supplies. The welfare effects are examined in terms of changes in consumers' and producers' surpluses. (Snyder-Calif Davis)
W79-00908

ECONOMIC IMPACT OF FLOODING ON AGRICULTURAL PRODUCTION IN NORTHEAST CENTRAL NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch, and F. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 420, Price codes: A04 in paper copy, A01 in microfiche. Agricultural Economics Report No. 120, August 1977. 57 p, 4 fig, 32 tab, 5 append. OWRT A-043-NDAK(3), 14-31-0001-5034.

Descriptors: *Flood damage, Wetlands, Drainage, Attitudes, *Agriculture, *Economic impact, Flood control, *North Dakota.

Two farm operator surveys were conducted in the Devils Lake Basin of North Dakota to collect information on farmer attitudes and dollar losses associated with flooding of agricultural land. A preliminary survey was drawn to assess farm operator attitudes toward wetland, drainage, and flooding; and to identify problem areas relative to collecting information on dollar losses due to flooding. Respondents felt that wetlands were a nuisance to their farm operations and should be drained. One-third of the respondents felt their flood problems were associated with drainage upstream. A detailed survey was conducted to estimate flood damage on the basis of a composite acre for the Basin. The estimated annual average loss on land that may be affected by flooding in the Devils Lake Basin was $8.71 using long-run price relationships, and $13.03 using 1974 price relationships. The annual average total dollar loss due to flooding in the entire Basin was estimated to be $1.9 million using long-run price relationships, and $2.9 million using 1974 price relationships. A methodology for determining composite flood losses is presented.
W79-00911

PRINCIPLES OF WATER RESOURCES PLANNING (PHASE II),
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 317, Price codes: A03 in paper copy, A01 in microfiche. Partial Technical Completion Report, November 1978. 26 p. OWRT A-048-NJ(5), 14-34-0001-8032.

Descriptors: *Regional analysis, *Discount rates, *Interest rates, *Environment, *Social aspects, *Planning, *Ecology, Waste treatment, Water quality, Economics, *Indirect effects, *Regional sewerage systems.

As part of a broad attempt to define principles which should govern water resource planning, an analysis has been made of three outstanding problems. The first subject is the discount rate. Analysis indicates that current governmental policy appears to require a rate higher than would be desirable on social and economic grounds. The second subject is the evaluation of environmental quality. In spite of many conflicting ideas the basic concept appears to be to provide for man's health and enjoyment as regards living space, working space and recreation space. Methodology for measuring and evaluating is investigated. The third subject is the so-called regional sewerage systems. Economic strengths and weaknesses, social, economic and environmental indirect effects, and some institutional problems were examined.
W79-00913

THE CURRENT STATE OF EMERGENCY PLANNING FOR WATER SUPPLY IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00923

THE TRENTON WATER CRISIS OF 1975: IMPRESSIONS AND ANALYSIS,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00926

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMIC REALITIES OF DROUGHT,
For primary bibliographic entry see Field 6B.
W79-00582

MARKET IMPERFECTIONS AND THE OPTIMUM RATE OF DEPLETION OF NATURAL RESOURCES,
F. Khalatbari.
Economica, Vol. 44, No. 176, November 1977, p 409-414. 8 ref.

Descriptors: *Economics, *Optimization, *Resource depletion, *Common pools, *Property rights, *Exhaustible resources, Environmental economics, Natural resources, Model studies, Mathematical models, Equations, Taxes, Bias, Oligopoly, Subsidies, Prices, Interest rates, Market value.

A model is constructed to analyze the significance of common pools in the economics of exhaustible natural resources. Imperfectly defined property rights is one of two broad categories of market imperfections at length in the literature (with non-competitive resource owners); both contribute to biases in the exploitation rate of an exhaustible natural resource. Biases are discussed here in light of the accepted theory that with negligible extraction costs the pace of resource extraction under fully competitive conditions is such that the market price raises at the rate of interest. Belief that

common property must lead to overextraction has generated regulations controlling extraction. If two or more people have access to the same pool, it is presumed that each owner will try to deplete the resource at a higher rate than would be the case with well-defined property rights. This analysis assumes there is a fixed and finite number of extractors having access to the pool, which is large relative to total reserves. The model demonstrates that stocks are depleted quicker in the common pool case than in the oligopolistic case. Should any biases owing to the oligopolistic market (compared with the socially controlled market) be in the direction of resource under-utilization, common pools could speed up depletion, therefore approximating the socially desirable depletion pattern and preventing waste. The optimum tax policy is also derived. (Lynch-Wisconsin)
W79-00583

THE EXPLOITATION OF EXTRACTIVE RESOURCES: A SURVEY,
For primary bibliographic entry see Field 6B.
W79-00584

OPTIMUM DEPLETION OF NATURAL RESOURCES: SOME GENERAL ISSUES,
Kansas Univ., Lawrence. Inst. for Social and Environmental Studies.
For primary bibliographic entry see Field 6B.
W79-00587

TO TELL THE TRUTH: IMPERFECT INFORMATION AND OPTIMAL POLLUTION CONTROL,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5G.
W79-00588

ENVIRONMENTAL QUALITY AND GAINS FROM TRADE,
Mannheim Univ. (West Germany).
For primary bibliographic entry see Field 5G.
W79-00589

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A COMMENT (SMITH),
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W79-00596

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A COMMENT (ELLIOTT AND YARROW),
Newcastle-upon-Tyne Univ. (England).
For primary bibliographic entry see Field 6B.
W79-00597

COST-BENEFIT ANALYSIS AND ENVIRONMENTAL POLICY: A REPLY TO ELLIOTT AND YARROW AND TO SMITH,
Aberdeen Univ. (Scotland). Dept. of Political Economy.
For primary bibliographic entry see Field 6B.
W79-00598

METHODS TO EFFECT COST REDUCTIONS IN MUNICIPAL WATER SYSTEMS,
Mississippi Univ., University Bureau of Business and Economic Research.
W. E. Boyet, K. W. Hollman, S. C. Shull, and R. S. Glaze.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 315, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University, Mississippi State Water Resources Research Institute Report, September 1978. 33 p, 4 tab. OWRT A-116-MISS(2), 14-34-001-8026.

Descriptors: Economies, Costs, Potable water, Water purification, *Economies of scale, *Cost comparisons, Returns to scale, *Planning, Budgeting, Decision making, Water allocation, Management, Model studies, Regression analysis.

The project involved the development of a model for isolating the variables which affect significantly the cost of water sold by Mississippi municipal water systems. Multiple regression analysis was used in the development of the predictive equations. The results provide information regarding the elasticity of cost with respect to size, as well as the relative impact of other physical, financial, and socioeconomic variables on water cost. The following procedure was used: (1) A cross section of 88 Mississippi municipal water firms comprised the study group; (2) Information on the selected systems was collected by means of interviews and from financial records and other secondary sources; and (3) Variables included in the analysis were: (a) number of customers served, (b) gallons of water sold, (c) expenses by various kinds of disaggregation, (d) source of water, (e) well depth, (f) area served in square miles, and others. Knowledge of the effect of these variables on the cost of water will assist policy makers in water system planning. Since the report is concerned with economies of scale, it will also be helpful to State water regulatory authorities in assessing the merits of consolidating smaller systems into larger operational units.
W79-00678

ANALYSIS OF ECONOMIC EFFECTS OF ENVIRONMENTAL REGULATIONS ON THE INTEGRATED IRON AND STEEL INDUSTRY. VOLUME I.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W79-00788

ECONOMIC IMPACT OF PROPOSED THERMAL DISCHARGE STANDARD FOR LAKE SANGCHRIS,
Oberlin Coll., OH.
For primary bibliographic entry see Field 5G.
W79-00792

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch, and D. F. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 433, Price codes: A07 in paper copy, A01 in microfiche. Agricultural Economics Miscellaneous Report No. 27, August 1977. 132 p. OWRT B-034-NDAK(1), 14-34-0001-7127.

Descriptors: *Bibliographies, *Economics, *Values, *Fish, *Widlife, Habitats.

This selected annotated bibliography of economic values of fish and wildlife with 691 entries is organized into the following eight general categories: (1) Wetland Economics; (2) Economics of Fish and Wildlife and Their Habitats; (3) Miscellaneous Evaluation Techniques with Application to Fish and Wildlife; (4) Socioeconomic Characteristics of Hunters and Fishermen; (5) Outdoor Recreation Economics; (6) Natural Resource Economics; (7) Water Resource Economics Related to Fish and Wildlife; and (8) Bibliographies. An alphabetical author index is provided. Government document numbers and Ph.D dissertation abstract numbers are given for many of the references.
W79-00912

6D. Water Demand

ESTABLISHING CROP ACREAGE FLEXIBILITY RESTRAINTS FOR SUBREGIONS OF THE TEXAS HIGH PLAINS,
Texas A and M Univ., College Station.
G. D. Condra, and R. D. Lacewell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 354, Price codes: A03 in paper copy, A01 in microfiche. Texas Water Resources Institute Technical Report No. 82, January 1977. 27 p, 5 tab, 18 ref. OWRT A-037-TEX(1).

Descriptors: *Mathematical models, *Computer models, *Acreage, *Crops, *Water demand, *Texas, Agriculture, Forecasting, Flexibility restraints, Crop production, Climatic data, Model studies, Regional analysis, Regression analysis, Statistical models, Statistical methods.

Constraints needed in cropping pattern shifts in linear programming models used to derive water and other input demand for major crop acreages in subregions of the Texas High Plains were studied. Such constraints, referred to as flexibility restraints, are needed because of institutional, marketing machinery, and price uncertainty factors. Alternative estimating models for establishing acreage flexibility were developed and the results of these models in estimating flexibility restraints were evaluated using statistical measures and subjective analysis. Models analyzed ranged from a simple linear regression model, in which the current year's acreage is expressed as a function of last year's acreage, to a multiple regression model in which economic and climatological variables were considered. The multiple regression model did not give satisfactory results; however, the simpler models did perform acceptably. One of these was selected, based on statistical measures and a prioria expectations, and used to calculate crop acreage flexibility restraints for three subregions of the Texas High Plains. (Majtenyi-IPA)
W79-00505

PROBLEM-RESEARCH ANALYSIS IN THE U.S. VIRGIN ISLANDS INSULAR REGION, ATLANTIC SUBREGION,
College of the Virgin Island, St. Thomas. Caribbean Research Inst.
For primary bibliographic entry see Field 6B.
W79-00511

ENVIRONMENTAL QUALITY EXPENDITURE PATTERNS AND URBAN LOCATION: EFFECTS ON INCOME GROUPS,
Ottawa Univ. (Ontario), Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 6G.
W79-00586

A DYNAMIC SIMULATION OF REGIONAL ECONOMIC PERFORMANCE WITH ALTERNATIVE WATER POLICIES,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-00854

DECISION THEORY APPLICATIONS AND IRRIGATION OPTIMIZATION,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W79-00857

ECONOMIC IMPACT OF FOSSIL ENERGY ALTERNATIVES ON CALIFORNIA IRRIGATED AGRICULTURE,
California Univ., Davis. Dept. of Agricultural Economics.

For primary bibliographic entry see Field 6B.
W79-00908

WORKING PAPER NOS. 7 - 10 OF THE EMERGENCY WATER ALLOCATION PROJECT, (7) IMPLEMENTATION OF A PREPAREDNESS PROGRAM; (8) ACHIEVING EQUITABLE AND EFFECTIVE WATER ALLOCATION; (9) RESTORATION OF A WATER DISTRIBUTION NETWORK; (10) IMPROVING EMERGENCY PREPAREDNESS,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
For primary bibliographic entry see Field 4A.
W79-00919

WORKING PAPER NO. 11 OF THE EMERGENCY WATER ALLOCATION PROJECT, MANUAL FOR WATER SERVICE EMERGENCIES FOR THE POWAY MUNICIPAL WATER DISTRICT,
California Univ., Irvine. School of Engineering; and California Univ., Irvine. Graduate School of Administration.
For primary bibliographic entry see Field 4A.
W79-00920

AN OUTLINE FOR THE STUDY OF EMERGENCY WATER ALLOCATION PROCEDURES,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00921

A CONCEPTUAL MODEL OF THE WATER DELIVERY SYSTEM IN THE SAN DIEGO AREA,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00922

6E. Water Law and Institutions

THE POLITICS OF HYDROELECTRIC POWER IN ALASKA: RAMPART AND DEVIL CANYON--A CASE STUDY,
Alaska Univ., College. Inst. of Water Resources.
C. M. Naske, and W. R. Hunt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 116, Price codes: A04 in paper copy, A01 in microfiche. Report No. IWR-87, Jan 1978. 60 p, 74 ref, append. OWRT A-060-ALAS(1).

Descriptors: *Alaska, *Hydroelectric plants, *Decision making, *Planning, *Project post-evaluation, *Political aspects, Social aspects, Governments, State governments, Water resources development, Federal Government, Governmental interrelations, Area development, Environment, Environmental effects, Environmental control, Water utilization, History.

The decision making process involved in development of hydroelectric projects in Alaska is reviewed. Three projects are discussed: Eklutna, which is presently functioning; Rampart, which was not constructed; and Devil Canyon, which is still being planned. Although all three projects have different locations and goals, their histories reveal all the essential elements involved in hydroelectric power construction projects. The roles of several government agencies and the public were assessed. Factors in the power debate, such as environmentalist position, political support, newspaper coverage and sponsorship, and official commitments were examined. Neither corruption nor misrepresentation were involved in the decision to abandon the Rampart project. The situation evolved due to choice of strategy in reaching a desired political conclusion.
W79-00512

A PROPOSED REVISION OF KENTUCKY'S WATER RIGHTS LEGISLATION,
Kentucky Water Resources Research Inst., Lexington.
R. C. Ausness.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 335, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 114, October 1978. 140 p, append. OWRT A-070-KY(1), 14-34-0001-7038, 14-34-0001-8019.

Descriptors: *Legal aspects, *Legislation, *Water law, Water policy, Water resources development, *Kentucky, *Water rights, Regulation, Withdrawal, Water wells.

Kentucky's present system of water law consists of a statutory water withdrawal permit system superimposed upon a body of common-law water rights doctrine. The rights of water users are often uncertain under this system, particularly in periods of water shortage. The proposed revision of Kentucky's existing water rights legislation would greatly reduce the significance of common-law water rights and would remedy some of the weaknesses in the present statue. Part 1 of the proposed statute establishes an administrative structure; Part 2 deals with water withdrawal permits; Part 3 retains the present statute's provisions on the regulation of dams and impoundments, while Part 4 sets forth the powers and responsibilities of the Kentucky Water Resources Authority. Part 5 deals with regulation of water wells. (Huffsey-Ky)
W79-00524

THE RELATIONSHIP BETWEEN COASTAL-ZONE MANAGEMENT AND OFF-SHORE ECONOMIC DEVELOPMENT,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W79-00593

THE CONTINENTAL SHELF AND THE EXCLUSIVE ECONOMIC ZONE: THE PROBLEM OF DELIMITATION AT UNCLOS III,
University of Wales Inst. of Science and Technology, Cardiff. Centre for Marine Law and Policy.
E. D. Brown.
Maritime Policy and Management, Vol. 4, No. 6, October 1977, p 377-408. 106 ref, 1 append.

Descriptors: *UNCLOS III, *Continental shelf, *Exclusive economic zone, *Oceans, *Law of the sea, *Water law, Legal aspects, Boundary disputes, Water rights, United Nations, Water resources, Water policy, United Kingdom, Zones, Commercial fishing.

A critical analysis is presented of proposed rules delimiting boundaries of oceanic continental shelves and exclusive economic zones (EEZ), to be considered by the Sixth Session of the Third United Nations Conference on the Law of the Sea (UNCLOS III), meeting May-July 1977. Much work is needed on the draft of the rules, contained in the Revised Single Negotiating Text (RSNT), before agreement can be reached. Six zones are currently recognized in the seas: (1) internal waters, (2) continental shelf, (3) exclusive fishing zone, (4) territorial sea, (5) contiguous zone, and (6) high seas. The EEZ concept is now in an advanced development stage. The continental shelf of a coastal state is defined in RSNT (Article 64) as 'the sea-bed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured....' Regarding the EEZ of a coastal state, Article 44(1) of the RSNT refers to 'an area beyond and adjacent to its territorial sea, described as the exclusive economic zone.' Article 45 provides that 'the exclusive economic zone shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.' An appendix discusses the boundaries of the United Kingdom. (Lynch-Wisconsin)
W79-00594

COLORADO RIVER WATER CONSERVATION DISTRICT V. UNITED STATES: AN INCREASED ROLE FOR STATE COURTS IN THE ADJUDICATION OF FEDERAL RESERVED WATER RIGHTS,
S. O. Gaufin.
Utah Law Rev., Vol 1977, No. 2, p 315-29, 1977.

Descriptors: *Colorado River, *Federal-State water rights conflicts, *Federal reservations, *Judicial decisions, Adjudication procedure, Water rights, State jurisdiction, Federal jurisdiction, Jurisdiction, Reservation doctrine, Federal government.

In Colorado River Water Conservation District v. United States, the United States brought suit in federal district court on its own behalf and as trustees for certain Indian tribes seeking a declaration of its rights to water in Colorado Water Division No. 7. The government based its claim on the federal reserved water rights doctrine and state law. Defendants then sought adjudication of the identical issues in state court, and joined the federal government as defendant pursuant to the McCarren Amendment, which provides for a general waiver of immunity of state laws by the federal government in water rights suits against it. The federal court dismissed the government's suit because of the abstention doctrine. The Supreme Court upheld this dismissal, holding that the policy of the McCarren Amendment forced adjudication in a state proceeding. Analyzing this decision, the author concludes that the purpose of the decision was to authorize state court adjudication in addition to, but not to the exclusion of, federal adjudication. The author fears the Colorado River decision will nevertheless give state courts almost exclusive jurisdiction over general-adjudication-of-water-rights cases. (Horwich-Florida)
W79-00599

STATE AND FEDERAL REGULATION OF THE FLOOD PLAIN,
P. Hogan.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, $1.75. 1978. 37 p.

Descriptors: *Flood plains, *Flood plain zoning, *Flood plain insurance, *Local governments, Regulation, Governmental interrelations, Legislation, Florida, Disasters, Flood protection, Planning, Federal government.

A flood plain is an area adjacent to a river, lake or ocean that is subject to periodic flooding, either riverine or coastal. How often this can be expected to occur, and the period of the flood, is particularly important to the flood insurance industry. These are determinative factors in deciding what risks an insurance company will take. The standard by which flood plains are measured is the '100-year flood', or the flood level which has a one percent chance of occurring in any year at a given location. Maps issued by the Federal Insurance Administration are used by communities to determine whether flood insurance is needed and, if so, what rates are applicable. Florida has enacted much legislation in an effort to combat losses due to floods. The legislation lies in the areas of water management and zoning. The federal government possesses extensive authority in the flood control domain. Sources for this authority are the 'commerce' and 'welfare' clauses of the federal Constitution. The city of Palm Bay, Florida, lies in a flood plain. The report examines the city's

response to the flood insurance problem, and enumerates pertinent provisions of its Flood Plain Zoning Ordinance. (Spiegel-Florida)
W79-00600

MANDATORY DEDICATION AND IMPACT FEES: A MEANS OF SHARING THE BURDEN OF GROWTH IN THE MELBOURNE-TILLMAN DRAINAGE DISTRICT,
A. B. Corey.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611, $1.75. 1978. 32 p.

Descriptors: *Florida, *Public utilities, *Community development, *Cost sharing, Drainage districts, Costs, Facilities, Land use, Land development, Utilities, Treatment facilities.

In new community developments, it is imperative to determine at the earliest developmental stage who is to provide necessary services--such as water and sewers--local government or developers. Two methods of shifting the burden of providing these necessary services--such as water and sewers--local government or developers. Two methods of shifting the burden of providing these necessary services to the new residents who create the need are discussed: impact fees and mandatory dedications. The author suggests that impact fees are the more feasible method. One advantage of impact fees is that they are levied at the time building permits are issued, not at the time of the platting of the new subdivision. And impact fees generate revenue faster than tax assessment. Also, impact fees have a stronger predicate in Florida law than does mandatory dedication because the state Supreme Court has already ruled that municipalities have the authority to impose such fees. Other jurisdictions have upheld impact fees not only for water and sewer services, but for recreational facilities, fire protection, and educational facilities. On the other hand, the constitutionality of mandatory dedication ordinances has been litigated only as high as the appellate level in Florida and thus awaits state Supreme Court resolution. (Horwich-Florida)
W79-00601

FLORIDA COASTAL ZONE MANAGEMENT: AN ANALYSIS,
C. Fox.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611, $1.75. 1978. 32 p.

Descriptors: *Florida, *Coasts, *Management, *Administrative decisions, Administrative agencies, Legislation, Federal project policy, Cost sharing, State government, Regulation, Beaches, Comprehensive planning.

The Florida Coastal Coordinating Council was created in 1970. Its purpose was to implement what had appeared to be Florida's progressive coastal management program. After eight years with the Council now eight years old, doubts now exist as to the true concern of the Florida legislature for the coastal zone. Florida's present position concerning its coastal management program under the 1972 federal Coastal Zone Management Act (CZMA) is evaluated. Prior unsuccessful legislative attempts are discussed and reasons for the non-passage of the bills put forth and evaluated. Certain advantages accrue by obtaining federal approval under the CZMA. Two basic incentives exist. They are: the promise of federal consistency with state management programs, once approved; and monetary incentives to defray developmental and administrative program costs. Both are important factors. Also, the variety of financial assistance provided to help deal with impacts of energy facilities on the coastal zone must be considered. Finally, recommendations are made for future actions by Florida's legislature to move toward the goals established by it in 1970, concurrent with the creation of the coastal coordinating council. (Spiegel-Florida)
W79-00602

THE ICEBERG COMETH.: INTERNATIONAL LAW RELATING TO ANTARCTIC ICEBERG EXPLOITATION,
T. R. Lundquist.
Natural Resources Journal, Vol. 17, No. 1, p 1-41, January, 1977.

Descriptors: *Antarctic, *Icebergs, *Freshwater water supply development, Oceans, Sea ice, Melt water, Appropriation, Potable water, Resources development, Exploitation, Technology.

One solution to the anticipatedf problem of lack of fresh water is the utilization of Antarctic icebergs. The author reviews the existence of suitable technology, economic feasibility and possible environmental impact of iceberg utilization, and agrees with the conclusions of several other studies--that iceberg water is in fact a viable, 'least-cost' alternative in many situations. The legal status of Antarctica, and the legal impediments to iceberg exploitation are examined. Eighteen nations, referred to as the Antarctic Treaty Group (ATG), have historically asserted territorial claims or have acceded to the Antarctic Treaty which reserves the continent for peaceful purposes and guarantees freedom of scientific research. However, the Treaty is not binding on non-party nations, and it contains no provision regarding resource exploitation. Attempts by the ATG to resolve this resource allocation problem are examined. The United States' position, backed by considerable authority, is that because of the absence of any coastal sovereign, the high seas extend up to the Antarctic coastline. High seas rights are excluded from application of the Treaty, and thus Antarctic icebergs may be appropriated by Treaty and non-Treaty nations alike. (Stump-Florida)
W79-00603

RECLAMATION ACT OF 1902: AFTER 75 YEARS, 160 ACRE LIMITATION HELD VALID,
C. Lackmann.
Natural Resources Journal, Vol. 17, No. 4, p 673-78, October, 1977.

Descriptors: *Federal reclamation law, *Land tenure, *Irrigation districts, *Judicial decisions, Reclamation, Legislation, Irrigation, Federal government, Farms, Water rights, California.

The federal Department of the Interior (Department) brought suit to enforce compliance with Section 46 of the Omnibus Adjustment Act. The Section 46 puts a 160-acre limitation on irragable land an individual can own in an irrigation district receiving Bureau of Reclamation project water. In a companion case, non-landowner residents of Imperial Valley, California, sought enforcement of Section 5 of the 1902 federal Reclamation Act. Section 5 requires that a landowner receiving federal reclamation project water must be either a resident of the land benefited or residue in the immediate vicinity of that land. The federal government lost both cases. On appeal, the Court of Appeals stated that landowners do not impair any present perfected water rights of the District itself. Although landowners relied on the Department's practice of non-enforcement of Section 46, the court rejected this argument and reversed the lower court. The author concludes that the court's decision represents a victory for, and a step towards, preservation of the 'family farm'. Both cases will probably be appealed. (Spiegel-Florida)
W79-00604

IMPACT OF ENERGY DEVELOPMENT ON COLORADO RIVER WATER QUALITY,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-00605

WHERE DO ENVIRONMENTAL LAWS AND REGULATIONS STAND TODAY.,
Environment Information Center, Inc., New York.
For primary bibliographic entry see Field 5G.
W79-00607

'THE COMMON HERITAGE OF MANKIND': RESOURCE MANAGEMENT OF THE INTERNATIONAL SEABED,
S. Kotz.
Ecology Law Quarterly, Vol. 6, No. 1, p 65-108, 1976.

Descriptors: *Law of the sea, *Natural resources, *Exploitation, *United Nations, Mining, Oceans, International law, International waters, Economic impact, Environmental effects, Marine geology, Negotiations.

In the past, the freedom of the sea concept has governed the development of ocean law. The result of this policy was the domination of the great maritime powers in the field of seabed exploitation. Recently, the developing countries have sought to abandon past policy and institute, by means of a solid majority in the United Nations, an allocation of ocean resources favoring their own development. Developing coastal states are hoping to accomplish this goal by extending their territory through appropriation of adjacent maritime zones at great distances from their shores. Other developing countries call for limiting appropriation of this type while establishing an international authority to control the resulting public international domain of the deep seabed. This article begins with an analysis of the seabed mineral resources at stake. This is followed by a description of the various interest blocs, with emphasis on the United States and the developing countries. An examination of the environmental and economic impacts of seabed mining demonstrates the feasibility of a relatively independent international seabed resource authority. Basic policy choices in structuring that authority are then outlined. (Quarles-Florida)
W79-00608

FEDERAL RESERVATION OF GEOTHERMAL RESOURCES,
For primary bibliographic entry see Field 4B.
W79-00613

THE OTHER WATER POLLUTION (NONPOINT SOURCE POLLUTION),
For primary bibliographic entry see Field 5B.
W79-00614

A RIVER IN SPACE AND TIME,
B. Wirth.
Our Public Lands, Vol. 27, No. 3, p 5-8, Summer, 1977.

Descriptors: *Missouri River, *Montana, *Wild river act, *River regulation, Navigable waters, National parks, Recreation, Land management, Water management(Applied), Water resources, Wild rivers, Water conservation.

The preservation of the Missouri River became a reality in 1976 when that portion of the river known as the Missouri Breaks was added to the Nation's Wild and Scenic Rivers system. The section included runs from the Fred Robinson Bridge in the James Kipp State Park downstream for 149 miles to Fort Benton. This section remains free and unencumbered by development. The Missouri River has served as the main artery of the northern Great Plains and remains rich in history. This article traces the history of the river back through the days of the North American Plains Indians and the

Lewis and Clark expedition. The latter's exploits are recounted in some detail since their exploration established the Missouri as the major inland route for commerce and subsequent settlement of the West. The article discusses the process by which the river came to be included in the Wild and Scenic Rivers System. The National Park Service, the U.S. Army Corps of Engineers and the state of Montana all had a hand in the matter. The Bureau of Land Management must now develop a management plan for the area. (Quarles-Florida)
W79-00615

THE LAW OF THE SEA CONFERENCE AND ITS AFTERMATH,
In: Proceedings of the 71st Annual Meeting, American Society of International Law, April 21-23, 1977, San Francisco, California, Nafziger, J. A., ed., Lancaster Press, Lancaster, PA. 17604, p 107-28.

Descriptors: *Law of the sea, *United Nations, *Negotiations, *Conferences, Treaties, International law, Oceans, Internal water, Marine geology, Ownership of beds, International waters, Mining.

Deepsea mining issues constitute the largest set of unresolved issues before the Third United nations Law of the Sea Conference and remain the key to a comprehensive treaty. The Revised Single Negotiating Text proposed that the international Seabed Resources Authority grant mining rights to its own 'Enterprise', but that it must also grant rights to others on a nondiscriminatory basis. This idea was rejected as being too favorable to the United States. This article offers a panel discussion of the aftermath of the law of the Sea Conferene. Elliot Richardson, Chairman of the national Security Council Inter-Agency Task Force on the Law of the Sea, offers his observations of the conference and prognosticates a growing urgency among all participants to reach a settlement. J. Alan Beesley, Canada's Asst. Under-Secretary of State for External Affairs, discusses the implications of successes, failures and future prospects of the Conference and its diverse issues. Arvid pardo, University of Southern California, comments on two points that he felt received insufficient consideration at the Conference: (1) the principle ofthe seabed as the common heritage of mankind; and (2) the definition ofthe intentional seabed area.
W79-00616

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 2, DULUTH AND ALEXANDRIA, MINN.).
For primary bibliographic entry see Field 5G.
W79-00617

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 5, LEMARS, IOWA).
For primary bibliographic entry see Field 5G.
W79-00618

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 8, WASHINGTON, D.C.).
For primary bibliographic entry see Field 5G.
W79-00619

IOWA WATER QUALITY MANAGEMENT PLAN: DES MOINES RIVER BASIN,
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00645

IOWA WATER QUALITY MANAGEMENT PLAN: SUPPORTING DOCUMENT,
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00646

IOWA WATER QUALITY MANAGEMENT PLAN: NORTHEASTERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00647

IOWA WATER QUALITY MANAGEMENT PLAN: WESTERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00648

IOWA WATER QUALITY MANAGEMENT PLAN: SKUNK RIVER BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00649

IOWA WATER QUALITY MANAGEMENT PLAN: SOUTHERN IOWA BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00650

IOWA WATER QUALITY MANAGEMENT PLAN: IOWA-CEDAR RIVER BASIN.
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00651

DRAFT ENVIRONMENTAL IMPACT STATEMENT, NORTH FULTON COUNTY AND NORTHEAST COBB COUNTY, GEORGIA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W79-00653

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS WATER QUALITY MANAGEMENT STUDY. VOLUME I.
Templeton, Linke and Alsup, Salt Lake City, UT.; and Engineering Science, Inc., Berkeley, CA.
For primary bibliographic entry see Field 5G.
W79-00660

THE NATIONAL ENVIRONMENTAL POLICY ACT AND FEDERAL WATER RESOURCES PLANNING: EFFECTS AND EFFECTIVENESS IN THE CORPS AND SCS,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00665

CAPE COD WATER QUALITY MANAGEMENT PLAN.
Massachusetts Water Resources Commission, Westborough. Water Quality Section.
For primary bibliographic entry see Field 5G.
W79-00666

BUREAUCRATS VS. VOTERS: ON THE POLITICAL ECONOMY OF RESOURCE ALLOCATION BY DIRECT DEMOCRACY,
Carnegie-Mellon Univ., Pittsburgh, PA. Graduate School of Industrial Administration.
T. Romer, and H. Rosenthal.
Work Paper No. 9, July 1977. 44 p 4 fig, 2 tab, 18 ref.

Descriptors: *Economics, *Voting, *Political aspects, Referenda, *Mathematical models, *Expenditures, *Administrative agencies, *Financing, *Bond issues, Democracy, Budgets, Model studies, Monopoly, Competition, Agendas, Oregon, Reversion point, Certainty, Uncertainty, Elections, Governments, Institutional constraints, Bureaucracy.

A model of 'direct democracy referendum voting patterns for public expenditures--tested with data from five years of public responses to school tax levy attempts in Portland, oregon--suggests two significant policy strategies for public agencies obliged to raise revenues through such unpredictable sources: (1) The probability of passage of any revenue-raising proposal increases each time the same proposal is put before the voters. (2) A small percentage should be cut from the preceding proposal each successive time it is re-issued. The monopoly model tested here assumes bureaus are expenditure maximizers, and that voters allow the bureaucracy to control the agenda; they respond as price-takers to the supply offer. On a given ballot voters have only a choice between and institutionally defined reversion expenditure andthe proposal offered by the bureau (or proposal setter). When the bureau has complete information about preferences and turnout the expenditure level depends critically on the reversion point; actual expenditures will be at least the level preferred by the median voter and never less. In the model, uncertainty is introduced as random voter turnout. For high reversion points as risk-neutral agenda setter will obtain a higher budget than with certainty, but for low reversion points uncertainty generally works against the setter. (Lynch-Wisconsin)
W79-00793

THE PROBLEM OF WATER,
Weizmann Inst. of Science, Rehovoth (Israel).
For primary bibliographic entry see Field 3B.
W79-00795

LAND TENURE AND DESERTIFICATION IN AUSTRALIA'S ARID LANDS,
R. W. Condon.
SEARCH, Vol. 9, No. 7, p 261-264, July 1978. 1 tab, 6 ref.

Descriptors: *Land tenure, *Australia, *Arid lands, Land use, Land management, Economic feasibility, Economic justification, Land reclamation, Droughts.

Utilization of Australia's arid lands which cover 5.7 million sq. km. or 74% of the country's total land area, has been governed by a land tenure system which has undergone considerable evolutionary change since settlement first began in the 1840's. Taking a slightly different direction in each of the states and territories, the land tenure system evolved from the system that was used in Great Britain. Formal settlement began after an initial period in which squatters fanned out over the country seeking the most favorable land. These first settlers with an over optimistic estimation of carrying capacity, caused severe degeneration and erosion of the land until economic depressions, prolonged droughts, and rabbit plagues began to cause disastrous situations. There have been two periods, one in 1901-02, the other from 1920-1940, in which severe drought and economic depression coincided with a burst of new settlement. Severe deterioration of land productivity particularly in arid western New South Wales, resulted. Since the middle of this century however an increasing awareness of the destructive processes has been coupled with a completely new set of more favorable circumstances. These circumstances include: (1) more favorable rainfall, (2) disappearance of the rabbit, (3) progressive breakdown in the size of

large properties into one-man family holdings with better water supplies and fencing, and (4) easier movement of livestock out of drought-affected areas. These factors along with a greater awareness of the desertification processes by the farmer, have contributed to a reversal of the earlier degenerative conditions. (Tickes-Arizona)
W79-00811

STRATEGY FOR THE DEVELOPMENT AND MANAGEMENT OF DESERTS.
For primary bibliographic entry see Field 4A.
W79-00818

USER'S MANUAL FOR PREMINING PLANNING OF EASTERN SURFACE COAL MINING, VOLUME I: EXECUTIVE SUMMARY,
Pennsylvania State Univ., University Park. Dept. of Mineral Engineering.
For primary bibliographic entry see Field 5G.
W79-00877

MISSISSIPPI WETLANDS PROTECTION PRACTICE AND PROCEDURE.
Mississippi Univ. Law Center, University.
Mississippi/Alabama Sea Grant Consortium Report No. MASGP-78-013, 1977. 56 p. SG-04-7-158-44017.

Descriptors: *Wetlands, *Mississippi, *Legislation, Shore protection, Ecosystems, Estuarine environment, Coastal zone management.

A survey of wetlands protection in Mississippi was made by examination of: (1) the importance of wetlands in the estuarine ecosystem; (2) analysis of Mississippi's wetlands protection, the stature and regulatory procedures; and (3) comparison of the Mississippi statute with those of Georgia, Alabama and North Carolina. (NOAA)
W79-00927

OIL POLLUTION CONTROL MECHANISMS - STATUTES AND REGULATIONS.
Mississippi Univ. Law Center, University.
For primary bibliographic entry see Field 5G.
W79-00928

6F. Nonstructural Alternatives

STATE AND FEDERAL REGULATION OF THE FLOOD PLAIN,
For primary bibliographic entry see Field 6E.
W79-00600

FLOOD PLAIN INFORMATION: OGDEN RIVER, OGDEN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00669

FLOOD PLAIN INFORMATION: BOX ELDER CREEK, BRIGHAM CITY, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00670

FLOOD PLAIN INFORMATION: WOLF CREEK, LAWTON, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00671

FLOOD PLAIN INFORMATION: CHIKASKIA RIVER, BLACKWELL, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00672

FLOOD PLAIN INFORMATION: PROVO RIVER AND ROCK CANYON CREEK, PROVO-OREM, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00673

FLOOD PLAIN INFORMATION: COODY CREEK, MUSKOGEE, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00674

FLOOD PLAIN INFORMATION: HAIKEY CREEK, TULSA COUNTY, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00675

FLOOD PLAIN INFORMATION: PRYOR CREEK AND SALT BRANCH, PRYOR CREEK, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00676

FLOOD PLAIN INFORMATION: STILLWATER CREEK AND TRIBUTARIES, STILLWATER, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00677

6G. Ecologic Impact Of Water Development

AN AERIAL SURVEY OF WATERBIRD COLONIES ALONG THE UPPER MISSISSIPPI RIVER AND THEIR RELATIONSHIP TO DREDGED MATERIAL DEPOSITS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. H. Thompson, and M. C. Landin.
Technical Report D-78-13, April 1978. 103 p, 10 tab, 96 ref, 2 append.

Descriptors: *Birds, *Water birds, *Waterfowl, *Mississippi River, *Habitats, *Dredged material, *Waste disposal sites, *Aerial surveys.

Aerial surveys of 1040 km of the Upper Mississippi River, Locks and Dams 1-26, showed 35 active colonies of five species of larger waterbirds (great blue heron, great egret, black-crowned night heron, double-crested cormorant, and Forster's tern) nesting in the floodplanin. In addition, green herons and yellow-crowned night herons are reported as nesting, although location by aerial survey was not possible due to cryptic coloration and nest placement beneath the tree canopy. No species were found nesting on dredged material. In general, colonies were located on isolated insular natural sites on the east side of the river below dams and/or tributaries. Dredged material sites were found to be unsuitable for nesting because of high human recreational use of dredged material and the early succession of vegetation stages present.
W79-00542

COLONIAL BIRD USE AND PLANT SUCCESSION ON DREDGED MATERIAL ISLANDS IN FLORIDA; VOL. I: SEA AND WADING BIRD COLONIES,
Seabird Research Inc., Culver City, CA.
R. W. Schreiber, and E. A. Schreiber.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A056 086, Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-78-14, April 1978 (In 2 volumes). 127 p, 21 fig, 10 tab, 65 ref, 2 append.

Descriptors: *Birds, *Shore birds, *Habitats, *Plant populations, *Florida, *Islands, *Succession, Waterfowl, Water birds, *Dredged material.

Bird use of dredged material islands in five areas of Florida was studied. The use of these islands by birds, particularly by colonial nesting sea and wading birds, was documented with two visits to each of 40 selected islands in five study areas in 1977. The islands were used as nesting habitat by 26 species of colonial and 8 species of noncolonial birds. The islands were also used extensively for feeding, loafing, and roosting by these and other species. Various species-habitat interactions and the significance of dredged material islands to colonial nesting sea and wading birds are discussed in detail.
W79-00543

COLONIAL BIRD USE AND PLANT SUCCESSION ON DREDGED MATERIAL ISLANDS IN FLORIDA; VOL. II: PATTERNS OF PLANT SUCCESSION,
Seabird Research Inc., Culver City, CA.
R. R. Lewis, III, and C. S. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 803, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-14, April 1978 (In 2 volumes). 175 p, 75 fig, 44 tab, 36 ref.

Descriptors: *Birds, *Shore birds, *Plant populations, *Habitats, *Florida, Islands, *Succession, *Dredged material.

This study was made to determine succession of vegetation on various aged dredged material islands in Florida. Forty islands in five selected study areas were intensively examined. An extensive literature review was conducted. Vertical aerial photographs and vegetation maps of each island are presented. A total of 141 plant species were found to occur on the islands. In Florida, typical island vegetation occurred through colonization by propagules from water-, wind-, and bird-carried sources. Marsh grasses such as smooth cordgrass preceded establishment by upland species such as Brazilian pepper, Australian pine, sabal palm, and herbaceous and grass cover. Bird use of the islands was directly related to the stage of plant succession, and bird fecal material was found to affect the vegetation both adversely and beneficially depending upon location. Recommendations for management include creation of new islands and enlargement and stabilization of existing eroding islands for bird use. Maintenance of unvegetated sites as critical habitat for terns and black skimmers is also recommended. (See also W79-00543) (WES)
W79-00544

AN ASSESSMENT OF THE POTENTIAL IMPACT OF DREDGED MATERIAL DISPOSAL IN THE OPEN OCEAN,
Terco Corp., College Station, TX.
For primary bibliographic entry see Field 5C.
W79-00549

ENVIRONMENTAL QUALITY EXPENDITURE PATTERNS AND URBAN LOCATION: EFFECTS ON INCOME GROUPS,
Ottawa Univ. (Ontario), Dept. of Geography and Regional Planning.
P. F. Ricci, L. E. Perron, and B. A. Emmett.
Socio-Economic Planning Sciences, Vol. 11, No. 5, 1977, p 249-258. 4 fig, 4 tab, 27 ref.

Descriptors: *Environmental economics, *Social values, *Canada, *Cities, *Income distribution,

*Expenditures, Montreal(Canada), Locating, Economics, Social aspects, Pollutants, Pollution abatement, Econometrics, Motivation, Value, Income, Equity, Planning, Decision making.

Consumption patterns by residents of 11 major Canadian metropolitan areas for pollution-intensive goods and services were investigated, along with the relationship between median income and proxies for urban environmental quality in choice of location by Montreal residents. Conclusions: (1) In the metrolpolitan areas studied (1969) the wealthy consumed somewhat more pollution-intensive goods and services than the poor; (2) The wealthy consumed considerably more than the poor of certain items such as gasoline for automobile and air travel; (3) the economic costs of environmental regulation tend to fall more heavily on the poor, though economic theory suggests that the poor value increments of environmental quality relatively less than the rich; and (4) Montreal residents tend to spend their money on home and neighborhood improvements rather than seek locations with higher environmental quality and lower population density. Montreal residents were found to be affected by the urban environment in quantifiable ways which can be used in environmental policy-making and management. Despite the findings, it is not argued that pollution control should be abandoned because of risks of worsening existing income distribution inequities, nor is it proposed that environmental management be used in an effort to redistribute income. (Lynch-Wisconsin)
W79-00586

THE CONTINUING PROBLEM OF NON-NATIVE FISHES IN FLORIDA,
For primary bibliographic entry see Field 5G.
W79-00591

IOWA WATER QUALITY MANAGEMENT PLAN: DES MOINES RIVER BASIN,
Iowa Dept. of Environmental Quality, Des Moines. Water Quality Management Div.
For primary bibliographic entry see Field 5G.
W79-00645

ENVIRONMENTAL IMPACT COMPUTER SYSTEM ATTRIBUTE DESCRIPTOR PACKAGE, REFERENCE DOCUMENT.
Construction Engineering Research Lab., Champaign, IL.
For primary bibliographic entry see Field 7A.
W79-00652

DRAFT ENVIRONMENTAL IMPACT STATEMENT, NORTH FULTON COUNTY AND NORTHEAST COBB COUNTY, GEORGIA.
Environmental Protection Agency, Atlanta, GA. Region IV.
North Fulton County, GA WPC-GA 189. Northeast Cobb County, GA WPC-GA 173. July 6, 1973, 74 p, 5 fig, 5 tab, append

Descriptors: *Water quality, *Land use, *Drainage basins, *Urban runoff, Waste water treatment, *Georgia, Water supply, Sewage treatment, Governments, Computer programs, Fulton County(GA), Cobb County(GA), *Environmental effects, Chattahoochee River(GA), Environmental Impact Statements, Sewer lines, Interceptors, Buffer zones.

This draft EIS addresses a proposed plan for providing collection and treatment of domestic sewage in parts of North Fulton County and Northeast Cobb County, GA and possible alternatives to that plan. It covers projects which are proposed for additional sewering of the approximate middle third of North Fulton County, a contiguous area in Cobb County, and sewers for areas south of the Chattahoochee River. Background information is provided on drainage basins, a general description of the area, existing water supply and sewerage facilities, population projections, and governmental activities. The primary beneficial effect of the proposed projects is the enhancement of public health and welfare. Modern wastewater collection and treatment techniques will protect the Chattahoochee River from wastewater discharges. This river is used as a water supply and recreation facility and the proposed treatment facilities will meet the standards for water quality under the FWPCA. The primary adverse effect of the proposed projects is the stimulation of secondary effects caused by urban development, such as urban runoff, soil erosion, and reduction of the aesthetic values. Other adverse effects would result from the actual construction of the facilities, including removal of vegetation and short-term erosion and siltation. The appendix provides a simplified FORTRAN program for developing a rudimentary method for calculating contaminant concentrations and flood water quantities for specific rainfall events. (Coan-NC)
W79-00653

PROCEEDINGS OF THE FIRST US/USSR SYMPOSIUM ON COMPREHENSIVE ANALYSIS OF THE ENVIRONMENT.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For Sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 and Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 600, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/9-75-004, March 25-329, 1974, 196 p.

Descriptors: *Economics, *Systems analysis, *Biochemical oxygen demand, *Ecology, Mathematical models, Chemicals, Pollution, Environmental control, Air quality, Air pollution, *Bioclimatology, *Environmental management, *Environmental analysis, USSR, Biosphere, Human stress, Maximum permissible load, Modelling, Environmental surveys, Environmental pollution.

These proceedings include the 24 papers presented at the first US/USSR symposium on environmental matters. The papers presented were grouped into the following categories: theme-analysis to support environmental management; comprehensive modelling; maximum permissible loading; economic criteria for establishing environmental quality goals; implementation strategies for achieving and maintaining environmental standards; impact of pollution and environmental conditions on non-human species; and pollution impacts on climate. The purpose of the symposium was to consider comprehensively the entire complex interacting environmental system within the context of certain socio-economic constraints. Questions of social risk, maximum permissible environmental stress necessary to protect public health, cost of control plans, and other points were raised during the symposium and treated at length in the proceedings' papers. The participants are from environmental and economic disciplines from both universities and governmental agencies in the US and USSR. (Coan-NC)
W79-00654

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT.
National Oceanic and Atmospheric Administration, Washington, DC. Office of Coastal Zone Management.
Also prepared by the N. C. Coastal Management Program, N.C. Department of Natural Resources and Community Development, Raleigh, 1978, 266 p.

Descriptors: *Coasts, *Planning, *Management, *Land use, *Coastal areas, *Coastal plains, Legal aspects, Regulation, Permits, Decision making, Legislation, Coordination, Administration, Conservation, Preservation, State jurisdiction, Local governments, Governmental interrelations, *Environmental Impact statement, *Coastal planning, *Areas of Environmental Concern, *North Carolina, *Coastal Zone Management Act, Implemenation, Enforcement, Development.

This volume is one of two, and contains the draft environmetal impact statement (DEIS) and program document for possible approval of the North Carolina Coastal Plan under the Federal Coastal Zone Management Act. Volume II contains the appendices to the program document. Part I of this volume is a summary of the N. C. Coastal Management Program; Part II is a description of the Program; and Part III fulfills the NEPA requirements for a DEIS. The North Carolina Coastal Managment Program proposes a cooperative state-local effort to protect and insure the orderly development of the coastal zone. The three mechanisms utilized to implement the program include local land use planning, State designation of areas of environmental concern (AECs), and shared state-local authority for regulating developent within AECs. Local land use plans are required and have been developed and approved according to State guidance for all coastal counties and municipalities. These land use plans will serve as one criterion for evaluating permit applications for development in AECs. AECs have been designated in order to protect the coastal area from either excessive or poorly designed development. Developemnt within a AEC requires a permit. The Coastal Resources Commission (CRC) issues major permits, and local permit officers issue minor permits. The Impact Statement identifies three potential problems with the coastal management program--the geographic extent of AECs may be insufficient; the State may not be able to insure State agency compliance with coastal policies in areas outside of AECs; and local governments may not be obligated to enforce the State-approved local land use plans. (See also W79-00659).
W79-00658

THE NATIONAL ENVIRONMENTAL POLICY ACT AND FEDERAL WATER RESOURCES PLANNING: EFFECTS AND EFFECTIVENESS IN THE CORPS AND SCS,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00665

COLONIAL BIRDS NESTING ON MAN-MADE AND NATURAL SITES IN THE U.S. GREAT LAKES,
Northwestern Michigan Coll., Traverse City.
For primary bibliographic entry see Field 2H.
W79-00765

STRATEGY FOR THE DEVELOPMENT AND MANAGEMENT OF DESERTS.
For primary bibliographic entry see Field 4A.
W79-00818

DESERTIFICATION OF AUSTRALIA IN ITS GLOBAL CONTEXT,
New South Wales Univ., Kensington.
J. A. Mabbutt.
SEARCH, Vol. 9, No. 7, p 252-256, July 1978. 1 tab, 7 ref.

Descriptors: *Desertification, *Australia, *Deserts, *Arid lands, *Land use, Droughts, Environmental effects, Land management, Land resources, Range management, Productivity, Dry farming, Drainage, Waterlogging, Salinity, Saline water intrusions, Irrigated land, Social aspects.

Since the Sahelian drought (1968-1974) the processes of desertification have been receiving

international attention, culminating with the U.N. conference on desertification in Nairobi (1977). The most important manifestations of desertification are analyzed here as the author attempts to put Australian arid region problems in a global context. Desertification, present to varying degrees throughout the world, is by no means restricted to arid regions. Deserts are not necessarily spread from a core outward but can advance by accretion as the state of a once productive area is reduced. Desertification has variable causes and effects in different agricultural or non-agricultural regions. Depending upon the type of land use, the process may be characterized by a deterioration of rangelands, falling yields and loss of productive dryland farming regions, waterlogging and salination of irrigated lands or unrevegetated mine fields. Human settlements have likewise had an impact upon sensitive arid regions not only by the mere increase of human activity but also through the distinctive regional character created by the inhabitants. (Tickes-Arizona)
W79-00819

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME I.
National Oceanic and Atmospheric Aministration, Boulder, CO. Environmental Research Labs.
Outer Continental Shelf Environmental Assessment Program, Work Statements, June 1978. 754 p.

Descriptors: *Baseline studies, *Environmental effects, *Alaska, Aquatic life, Birds, Biota, Fish, Geology, Hazards, Ice, Pollutants, Cold regions, *Outer Continental Shelf.

In this compilation statements of work in progress or in plan for the surveys of aquatic life or non-living resources likely to be involved in one way or another by resources development on the Alaskan Continental Shelf are given. These baseline studies deal with the specific life forms, geology, ice transport, hazards and ecology in this cold region. (NOAA)
W79-00895

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
Outer Continental Shelf Environmental Assessment Program, Work Statements, June 1978. 652 p.

Descriptors: *Baseline studies, *Alaska, *Resources development, Permafrost, Remote sensing, Mammals, Sea ice, Aquatic life, Water resources, Geological surveys, Geophysics, Pathology, Cold regions, *Outer Continental Shelf, Beaufort Sea, Bering Sea, Gulf of Alaska.

In this compilation statements of work in progress or in plan for the surveys of aquatic life or non-living resources likely to be involved in one way or another by resources development on the Alaskan Continental Shelf are given. These baseline studies deal with the specific life forms, geology, ice transport, hazards and ecology in this cold region. (NOAA)
W79-00896

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: PROGRAM WORK STATEMENTS FISCAL YEAR 1978, VOLUME III.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
Outer Continental Shelf Environmental Assessment Program Work Statements, June 1978. 846 p.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Alaska, Geological surveys, Hazards, Transport, Aquatic life, Water pollution, Oil pollution, Cold regions, *Outer Continental Shelf, Bering Sea, Beaufort Sea, Gulf of Alaska, Petroleum, Chemical pollutants, Hydrocarbons.

In this compilation statements of work in progress or in plan for the surveys of aquatic life or non-living resources likely to be involved in one way or another by resources development on the Alaskan Continental Shelf are given. These baseline studies deal with the specific life forms, geology, ice transport, hazards and ecology in this cold region. (NOAA)
W79-00897

HABITAT STRUCTURE AND STREAM FISH COMMUNITIES,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W79-00940

TAMANO OIL SPILL IN CASCO BAY: ENVIRONMENTAL EFFECTS AND CLEANUP OPERATIONS.
Environmental Protection Agency. Washington, DC. Spill Prevention and Control Board.
For primary bibliographic entry see Field 5G.
W79-00983

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME I.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Quarter October -December 1977, Environmental Assessment of the Alaskan Continental Shelf, March 1978. 511 p.

Descriptors: *Alaska, *Aquatic life, *Water pollution effects, *Baseline studies, Resources development, Oil pollution, Aquatic microbiology, Environmental effects, Pollutants, Biota, *Outer Contiental Shelf, Petroleum development.

Reports containing baseline studies are compiled in this quarterly report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from petroleum resources development and transport on the outer continental shelf of Alaska. The reports are grouped in the following categories: Receptors (Biota)--marine mammals, marine birds, marine fish and microbiology; Contaminant Baselines; and Effects. (See also W79-00999) (NOAA)
W79-00998

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Quarter October - December 1977, Environmental Assessment of the Alaskan Continental Shelf, March 1978. 606 p.

Descriptors: *Alaska, *Water pollution sources, *Baseline studies, Resources development, Environmental effects, Hazards, Transport, Data processing, *Outer Continental Shelf, Petroleum development.

Reports containing baseline studies are compiled in this quarterly report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from petroleum resources development and transport on the outer continental shelf of Alaska. The reports are grouped in the following categories: Transport, hazards and data management. (See also W79-00998) (NOAA)
W79-00999

7. RESOURCES DATA

7A. Network Design

PROBLEM-RESEARCH ANALYSIS IN THE U.S. VIRGIN ISLANDS INSULAR REGION, ATLANTIC SUBREGION,
College of the Virgin Island, St. Thomas. Caribbean Research Inst.
For primary bibliographic entry see Field 6B.
W79-00511

ON THE DESIGN OF HYDROLOGIC DATA NETWORKS,
Geological Survey, Reston, VA. Water Resources Div.; and Washington, Univ., Seattle; and Princeton Univ., NJ.
M. E. Moss, D. P. Lettenmaier, and E. F. Wood.
EOS Transactions, American Geophysical Union, Vol 59, No 8, p 772-775, August 1978. 8 ref.

Descriptors: *Network design, *Hydrologic data, *Data collections, *Design criteria, *Hydrologic structures, Engineering structures, Evaluation.

The organized collection of hydrologic data has been a steadily increasing activity in the United States since 1889, when the first stream-gaging station was established on the Rio Grande at Embudo, New Mexico. The hydrologic data network is the main link between the hydrologic phenomena and water resources engineering, for it is the primary conveyer of hydrologic information. Thus the design of the network should encompass both hydrology and engineering; that is, the design technique should account for the nature of the phenomena and for the uses that will be made of the data. (Woodard-USGS)
W79-00636

ENVIRONMENTAL IMPACT COMPUTER SYSTEM ATTRIBUTE DESCRIPTOR PACKAGE, REFERENCE DOCUMENT.
Construction Engineering Research Lab., Champaign, IL.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 303, Price codes: A99 in paper copy, A01 in microfiche. Technical Report E-86, April 1976, 769 p. 4A1621A-896-01-001.

Descriptors: *Environmental effects, *Ecology, *Groundwater, *Surface waters, *Economics, *Land use, *Transportation, *Aesthetics, *Computer program, Energy, Water resources, *Environmental Impact Statements, *Environmental Assessments, Air quality, Health sciences, Sociology, Earth science, Noise, Environmental attributes, Resource conservation, Energy conservation, U.S. Army.

The report's objective is to explain to the user of the Environmental Impact Computer System (EISC)--prepared for the U.S. Army--the meaning of those environmental attributes which are designated as 'impacted' in the project-related matrices for projects requiring preparation of Environmental Assessments and Environmental Impact Statements. The report explains why descriptor packages and paragraphs were developed, how to use them, and how they might help the user prepare Environmental Impact Statements and Assessments for their projects and programs in a more economical and efficient fashion. Explanations are given of the purpose, philosophy and methodology of the attribute descriptor packages and paragraphs. Three levels of environmental at-

tributes are described--detailed level attributes, review level attributes, and controversial attributes. The parts of the descriptor packages are explained along with instructions for using them to facilitate impact analyses. Finally, the report provides the user with a copy of all the descriptor packages and paragraphs developed to the time of printing. Environmental attributes are defined as those variables representing environmental characteristics. Changes in these variables are seen to provide indicators of change in the environment. Those attributes perceived as redundant, difficult to measure or obscure were eliminated. The three levels of attributes mentioned above were developed for each of the 12 specialty areas of ecology, health science, air quality, surface waters, ground waters, sociology, economics, land use, earth science (energy and resource conservation), noise, transportation and aesthetics. (Zayac-NC)
W79-00652

7B. Data Acquisition

A EXPERIENCE IN DECIPHERING SPACE PHOTOGRAPHS AND TELEVISION IMAGES OF THE USTYURT PLATEAU FOR HYDROLOGICAL PURPOSES (IN RUSSIAN),
V. V. Aristova, S. V. Viktorov, M. A. Danilova, A. L. Sadov, and N. S. Semina.
Probl Osvo Pustyn (1), p 15-28, 1977.

Descriptors: *Remote sensing, Geology, Kazakh-SSR, Meteorlogic data, Nimbus, Satellites(Artificial), Soyuz, USSR, *Grondwater sources, Aerial photography.

A review is given of data received on the general regional conditions of underground water formation in the Ustyurt Plateau (Kazakh SSR, USSR) by means of photography and television images from the satellites Soyuz 6 and 9 and the American Meteor and nimbus systems. The hydrogeological interpretation of space photographs depends on structural-geomorphological and landscape decephering and demands a thorough analysis of data from regional underground studies. Application of the greatly generalized and small-scale televison pictures helps to establish the general regional hydrogeological regularities and focus on the conditions of formation and discharge of ground and presdsurized water for hydrological regionalization of the territory. Analysis of separate small scale space photographs from the Soyuz 9 confirms their high informativeness and applicability in comparison to television photos for resolution of the given problems.--Copyright 1978, Biological Abstracts, Inc.
W79-00609

RECORDING WIRE STRAINMETERS ON THE BARNES ICE CAP, BAFFIN ISLAND, CANADA,
Cambridge Univ. (England). Dept. of Geodesy and Geophysics.
For primary bibliographic entry see Field 2C.
W79-00696

AN INVESTIGATION INTO THE USE OF STRAIN ROSETTES FOR THE MEASUREMENT OF PROPAGATING CYCLIC STRAINS,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W79-00697

A MECHANICAL TEST PROCEDURE FOR AVALANCHE SNOW,
Beck (R. W.) and Associates, Denver, CO.
For primary bibliographic entry see Field 2C.
W79-00698

ANCESTRAL NIAGARA RIVER DRAINAGE: STRATIGRAPHIC AND PALEONTOLOGIC SETTING,
State University of New York at Buffalo. Dept. of Geological Sciences.
For primary bibliographic entry see Field 4A.
W79-00703

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES.
California Univ., Berkeley. Space Sciences Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-10551, Price codes: A99 in paper copy, A01 in microfiche. Annual Progress Report, Series 16, Issue 34, May 1, 1975. 632 p. NASA NGL 05-003-404.

Descriptors: *Remote sensing, *Water resources, *California, Satellites(Artificial), Water supply, Water demand, Social impact, Costs, Forests, Vegetation, Data processing, Snow cover, Model studies, Snow, Mathematical models, Watersheds(Basins), Mapping, *LANDSAT.

For a good many reasons, the State of California continues to constitute an unusually favorable test site within which to conduct an integrated study of earth resources based on remote sensing techniques. The findings from this research are proving to be of great significance, both as an aid to the management of California's earth resources and also as a means for making similar remote sensing-based inventories to uniform standards on a global basis. Research efforts under this integrated multi-campus study continue to be directed primarily toward developing remote sensing techniques for the inventory and management of California's water resources. (Sims-ISWS)
W79-00711

U.S. ARMY CORPS OF ENGINEERS FIFTH HYDROGRAPHIC SURVEY CONFERENCE.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Conference held at Norfolk, Virginia, 8-9 November 1977. Hart, E. D. and Downing, G. C., eds. March 1978. 102 p, 5 append.

Descriptors: *Surveys, *Surveying instruments, *Hydrography, *Sounding, *Bathymetry, *Hydrographic surveys.

Consists primarily of proceedings from a conference on hydrographic surveying. Paper included discuss two new surveying systems, system mobility and data processing. 'Trailerable Automated Survey Boat,' by Donald Thrower, describes tests using a small boat data logger device. Several portable data collection systems are examined, especially in regard to track loss performance. 'Demonstration of Passive Reflector Navigation System for Dredging and Buoy Tending Operations,' by G. C. Downing, describes an evaluation study directed toward improving the techniques available for positioning marine vessels such as dredges. The passive reflector positioning system (PRANS) is discussed and its potential as a lower operating cost alternative to existing techniques is examined. 'Bathymetric Swath Survey System and Its Potential for Effective Bottom Mapping,' by W. T. Mobley, discusses the Bathymetric Swath Survey System (BS3) program in regard to the effectiveness of marine surveying, data quality, and techniques for acquiring and processing bathymetric data. 'Automated Survey System -- Data Processing,' by O. J. McCoy, describes the use of automated survey systems and methods of integrating the acquisition and processing data in such systems. Field system hardware and software capabilities are examined. (WES)
W79-00766

THE UNITED KINGDOM MARKET FOR AIR AND WATER PURIFICATION AND POLLUTION CONTROL EQUIPMENT,
Planning Research and Systems, Ltd., London (England).
For primary bibliographic entry see Field 5G.
W79-00790

WATER LEVEL MEASUREMENT DEVICE,
For primary bibliographic entry see Field 4A.
W79-00822

COMBINED HOUSING AND STANDARD FOR WATER FLOW METERS,
S. J. Niskin.
U.S. Patent No. 4,091,666, 6 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1667-1668, May 30, 1978.

Descriptors: *Patents, *Currents(Water), Current meters, Flow, Velocity, Measurement, Equipment.

The invention provides for cylindrical housings for current meters with a means for preventing the housing from being eratic in movement so that the true readings of current velocity and direction are attained. The cylindrical housing has a pair of flexible fins that lie in planes that intersect at right angles to each other at the axis of the housing. The fins increase the range of current velocity readings. The housing contains instruments for determining current velocity and direction in a body of water and has a standard connected to a vertical cable anchored at one end and has a float at the other end to prevent the housing from bobbing up and down with the wave action of the body of water. (Sinha-OEIS)
W79-00827

WATER SAMPLE COLLECTING DEVICE,
S. J. Niskin.
U.S. Patent No. 4,091,676, 10 p, 27 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 970, No 5, p 1671, May 30, 1978.

Descriptors: *Patents, *Sampling, *Water sampling, Valves, Equipment.

A water sample collecting device for obtaining a sample of water at a predetermined depth consists of a tubular member with spherical valves at both ends. The valves are maintained in a closed position when launches and opened after the device is descending in the water to permit flushing of the device. When the device has reached the desired depth a messenger causes the valves to rotate to the closed position at which time the sample of water is brought to the surface. (Sinha-OEIS)
W79-00828

LABORATORY AND FIELD MEASUREMENTS OF UPWELLED RADIANCE AND REFLECTANCE SPECTRA OF SUSPENDED JAMES RIVER SEDIMENTS NEAR HOPEWELL, VIRGINIA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W79-00881

A PLANKTON NET DESIGNED TO EXCLUDE AIR-SEA INTERFACE PHENOMENA,
Washington Univ., Seattle. Dept. of Oceanography.
J. R. Clayton, and S. P. Pavlou.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 369-377, 1978. 3 fig, 3 tab, 19 ref.

Descriptors: *Sampling, *Plankton, *Research equipment, Equipment, Nets, Plankton, Water analysis, Chemical analysis, Monitoring, Trophic

level, Zooplankton, Chlorinated Hydrocarbon pesticides, DDT, Polychlorinated biphenyls, Chromatography, Analytical techniques.

A description is presented of a protected closed plankton net whose purpose is to minimize the exposure of collected samples to surface films and debris. Tests described in this paper appeared to show that the protected closed net was not necessary for the environmental conditions encountered during our field studies. However, additional calculations based on the data of other investigators strongly imply that employment of such a net in heavily polluted surface waters may be highly advantageous for use in trace pollutant studies. (EIS-Deal)
W79-00943

A VERSATILE PUMP-SAMPLER FOR LIVE ZOOPLANKTON,
Central Electricity Generating Board, Southampton (England). Marine Lab.
J. Coughlin, and J. M. Fleming.
Estuaries, Vol. 1, No. 2, p 132-135, 1978. 2 fig, 1 tab, 10 ref.

Descriptors: *Sampling, *Pumps, *Zooplankton, *Thermal powerplants, *Entrainment, Data collections, On-site data collections, Reliability, Plankton, Steam turbines, Powerplants, Closed conduit flow, Pipe flow, Filters, Intakes, Outlets, Cooling water.

The sampler consists of a readily interchangeable nylon-mesh sleeve mounted on the suction of a submersible pump. The unit is compact and robust, with the mesh totally protected form external damage. Although designed primarily for use in the intakes and outfalls of power stations, this sampler and the variants described could find more general application. The incorporation of a submersible pump circumvents both the suction lift restriction and the problems associated with plankton travel through long lengths of hose that are inherent in previous designs. Less than 3% of the members of estuaries/inshore zooplankton so collected showed damage or had died within 48 hours of capture. (EIS-Deal)
W79-00949

7C. Evaluation, Processing and Publication

OPTIMIZATION OF REAL-TIME HOURLY OPERATIONS OF A COMPLEX, MULTIPLE PURPOSE RESERVOIR SYSTEM,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 6A.
W79-00501

STATISTICAL AND STOCHASTIC ANALYSES OF SYNTHETICALLY GENERATED URBAN STORM DRAINAGE QUANTITY AND QUALITY DATA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W79-00521

DEVELOPMENT OF COMPUTER PROGRAM FOR LINEARIZED SUBHYDROGRAPHS METHOD FOR URBAN RUNOFF DETERMINATION,
Akron Univ., OH. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W79-00526

AN OPEN-COAST MATHEMATICAL STORM SURGE MODEL WITH COASTAL FLOODING FOR LOUISIANA; REPORT 1, THEORY AND APPLICATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-00537

AVAILABILITY AND QUALITY OF GROUND WATER IN THE WINSTON AREA, DOUGLAS COUNTY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
J. H. Robison, and C. A. Collins.
Water-Resources Investigations 77-28 (open-file report), 1978. 2 sheets, 14 ref.

Descriptors: *Groundwater, *Water wells, *Water yield, *Water levels, *Water quality, Maps, Groundwater availability, Hydrogeology, Hydrologic data, Chemical analysis, Oregon, *Douglas County.

A map of the Winston area, Douglas County, Oreg., shows areal geology and locations and chemical diagrams of wells with water analyses. Another map of the area has diagrams showing the depth to water, pumping level, total depth, and yields of selected wells. Reported yields of wells range from less than 1 to as much as 70 gallons per minute; the average is less than 10. A table listing chemical analyses of water shows that, although most ground water is of adequate quality for domestic use, some wells yield water with dissolved constituents in excess of recommended limits. (Woodard-USGS)
W79-00620

THE QUALITY ASSURANCE PROGRAM OF A NATIONAL LABORATORIES SYSTEM,
Geological Survey, Albany, NY. Water Resources Div; and Geological Survey, Reston, VA. Water Resources Div; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W79-00621

A METHOD FOR ESTIMATING THE REGIONAL EFFECTS OF LAND USE ON RIVER-WATER QUALITY, SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-00622

STATISTICAL SUMMARY OF STREAMFLOW DATA FOR KANSAS STREAMS IN THE ARKANSAS RIVER BASIN,
Geological Survey, Lawrence, KS. Water Resources Div.
P. R. Jordan.
Kansas Water Resources Board, Streamflow Characteristics Technical Report No 14A, June 1978. 206 p, 4 fig, 1 tab, 2 ref.

Descriptors: *Streamflow, *Flow duration, *Low flow, *High flow, *Kansas, Streams, Flow rates, Average flow, Gaging stations, Drainage area, Natural flow, Regulated flow, Basic data collections.

Streamflow data for Kansas are summarized from all available daily-flow records through September 30, 1976. These summaries include flow duration by year, low-flow and high-flow sequences, and flow duration by months. Flow-duration summaries serve as a basis for appraising and comparing the hydrologic characteristics of drainage basins and for some classifications of streams for regulatory purposes. Low-flow summaries are useful in appraising the adequacy of streamflow to maintain minimum flows for municipal and industrial water supplies, irrigation, waste dilution, wildlife conservation, and in the design of water-supply reservoirs, and other flood-control works. Data summarized are for unregulated and regulated streamflow, but not for flow in canals such as diversions for irrigation. (Woodard-USGS)
W79-00626

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map CU-18, 1978. 1 sheet.

Descriptors: *Irrigation wells, *Withdrawal, *Drawdown, *Maps, *Taxes, Water loss, Water levels, Income, New Mexico, *Curry County, *Internal Revenue Service, *Tax deductions.

A map at the scale of 0.5 inch per mile shows areas in Curry County, New Mexico, where values of water level, in feet, have been assigned for the year 1977. This map was prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Curry County to calculate water-depletion losses for income tax purposes. The map is numbered CU-18. Copies may be obtained from the Office of the New Mexico State Engineer. (Woodard-USGS)
W79-00627

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN NORTHERN LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map LN-20, 1978. 1 sheet.

Descriptors: *Irrigation wells, *Withdrawal, *Drawdown, *Maps, *Taxes, Water loss, Water levels, Income, New Mexico, *Lea County, *Internal Revenue Service, *Tax deductions.

A map at the scale of 0.5 inch per mile shows areas in Lea County, New Mexico, where values of water level, in feet, have been assigned for the year 1977. This map was prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Roosevelt County to calculate water-depletion losses for income tax purposes. The map is numbered LN-20. Copies may be obtained from the Office of the New Mexico State Engineer. (Woodard-USGS)
W79-00628

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN CENTRAL LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map LC-20, 1978. 1 sheet.

Descriptors: *Irrigation wells, *Withdrawal, *Drawdown, *Maps, *Taxes, Water loss, Water levels, Income, New Mexico, *Lea County, *Internal Revenue Service, *Tax deductions.

A map of the scale of 0.5 inch per mile shows areas in Lea County, New Mexico, where values of water level, in feet, have been assigned for the year 1977. This map was prepared cooperatively by th New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved

by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas to calculate water-depletion losses for income tax purposes. The map is numbered LC-20. Copies may be obtained from the Office of the New Mexico State Engineer. (Woodard-USGS)
W79-00629

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN PORTALES VALLEY, ROOSEVELT COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map RO-21, 1978. 1 sheet.

Descriptors: *Irrigation wells, *Withdrawal, *Drawdown, *Maps, *Taxes, Water loss, Water levels, Income, New Mexico, *Roosevelt County, *Internal Revenue Service, *Tax deductions.

Map at the scale of 0.5 inch per mile shows areas in Roosevelt County, New Mexico, where values of water level, in feet, have been assigned for the year 1977. This map was prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Roosevelt County to calculate water-depletion losses for income tax purposes. The map is numbered RO-21. Copies may be obtained from the Office of the New Mexico State Engineer. (Woodard-USGS)
W79-00630

WATER RESOURCES OF NORTHEAST NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
H. B. Wilder, T. M. Robison, and K. L. Lindskov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A057 484, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-81, May 1978. 113 p, 71 fig, 6 tab, 73 ref.

Descriptors: *Water resources, Hydrology, *North Carolina, *Coastal Plains, Groundwater resources, Aquifer characteristics, Saline water-freshwater interfaces, Surface waters, Saline water intrusion, Atlantic Ocean, Topography, Northeast North Carolina, Lake Phelps, Lake Mattamuskeet, Albemarle Sound, Pamlico Sound, Castle Hayne limestone, Corporate farms.

Several water-related problems are associated with economic development of northeast North Carolina. The solution to these problems depends in part on adequate knowledge of the hydrology of this 8,930 square mile coastal area. Average annual precipitation on the area is about 50 inches. Of this amount, about 34 inches returns to the atmosphere by evapotranspiration, about 15 inches leaves the area as runoff, and about one inch leaves through ground-water outflow. No large stream originates within the area, but major streams entering from the north and west bring in three times as much streamflow as originates within the study area. The flat, low-lying terrane does not offer opportunities for extensive development of surface-water supplies through the use of reservoirs. Much of the surface water is contaminated by saltwater from the ocean. Ground water occurs in three major aquifers, all of which contain both freshwater and saltwater. (Woodard-USGS)
W79-00631

ON THE DESIGN OF HYDROLOGIC DATA NETWORKS,
Geological Survey, Reston, VA. Water Resources Div.; and Washington, Univ., Seattle; and Princeton Univ., NJ.
For primary bibliographic entry see Field 7A.
W79-00636

GLOBAL DISTRIBUTION OF CARBON DIOXIDE DISCHARGERS, AND MAJOR ZONES OF SEISMICITY,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, El Paso, TX. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-00637

FLOODS IN KANSAS CITY, MISSOURI AND KANSAS, SEPTEMBER 12-13, 1977,
Geological Survey, Rolla, MO. Water Resources Div.; and Geological Survey, Topeka, KS. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-00638

HYDROLOGIC RECONNAISSANCE OF TSALA APOPKA LAKE, CITRUS COUNTY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
A. T. Rutledge.
Geological Survey Water-Resources Investigations 77-89 (open-file report), 1977. 1 sheet, 8 fig, 12 ref.

Descriptors: *Lakes, *Surface-groundwater relationshipsm, *Inflow, *Discharge(Water), *Water quality, Maps, Hydrologic data, Groundwater recharge, Groundwater movement, Aquifer characteristics, Ponds, Swamps, Florida, *Tsala Apopka Lake, *Citrus County, *Lake hydrology.

The swamps, marshes, and open waters of Tsala Apopka Lake, Florida, were mapped and the hydrologic connection between the lake and the Floridan limestone aquifer was studied from October 1975 to September 1976. Tsala Apopka Lake is a series of shallow, interconnected lakes, ponds, and marshes whose water surface slopes northward at 0.5 foot per mile. According to aerial photographs of December 1972, only 6 percent of the 103 square miles of study area is covered by open water. Open water is abundant along the western side of the lake, dense and sparse marshes occupy most of the lake area, and swamps occupy a thick zone around the Withlacoochee River which borders the lake to the east. Only a small fraction of the total surface flow occurs through the lake. The average lake outflow through S-351 canal is 23.6 cfs; while the average river flow at Holder is 714 cfs. Tsala Apopka Lake is hydraulically connected to the Floridan aquifer. At low flow, the major source of water in the river is ground water from the Floridan aquifer. The specific conductance of water in the Floridan aquifer averages 250-350 umho/cm (micromhos per centimeter) at 25C in this area. The specific conductance of water in the Withlacoochee River near Holder averages 268 umho/cm at 25C, while water in Tsala Apopka Lake at Hernando averages 139 umho/cm at 25C. (Woodard-USGS)
W79-00639

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977--VOLUME 2. TRUST TERRITORY OF THE PACIFIC ISLANDS, GUAM, AMERICAN SAMOSA, AND NORTHERN MARIANA ISLANDS.
Geological Survey, Honolulu, HI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 978, Price codes: A05 in paper copy, A01 in microfiche. Water-Data Report HI-77-2, May 1978. 90 p, 15 fig.

Descriptors: *Streamflow, *Hydrologic data, *Surface waters, *Groundwater, Gaging stations, Water analysis, Water temperature, Reservoirs, Water wells, Water levels, Data collections, Sites, *Trust Territory of the Pacific Islands, *Guam, *American Samoa, *Northern Mariana Islands.

Volume 2 of water resources data for the 1977 water year for other Pacific areas consists of records of stage, discharge, and water temperature; stage of a reservoir; and water levels in wells and springs. This report contains discharge records for 42 gaging stations, stage only record for 1 gaging station, water temperature for 26 gaging stations, and water levels for 13 observation wells. Also included are 56 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Governments and Federal agencies in other Pacific areas. (Woodard-USGS)
W79-00640

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1977--VOLUME 1. HAWAII.
Geological Survey, Honolulu, HI. Water Resources Div.
Water-Data Report HI-77-1, May 1978. 348 p, 14 fig.

Descriptors: *Hawaii, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Volume 1 of water resources data for the 1977 water year for Hawaii consists of records of stage, discharge, and water quality of streams; and water levels and water quality in wells and springs. This report contains discharge records for 114 gaging stations; water quality for 10 gaging stations, 102 partial-record flow stations and 155 wells; and water levels for 25 observation wells. Also included are 108 crest-stage partial-record stations and 20 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, Federal, and other agencies in Hawaii. (Woodard-USGS)
W79-00641

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1977.
Geological Survey, Lansing, MI. Water Resources Div.
Water-Data Report MI-77-1, June 1978. 548 p, 9 fig.

Descriptors: *Michigan, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water temperature of ground water. This report contains discharge records for 195 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 77 continuous-record stations, 21 partial-record stations and 7 lakes; and water levels for 45 observations wells. Also included are 88 crest-stage partial-record stations and 31 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are

published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Michigan. (Woodard-USGS)
W79-00642

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1977.
Geological Survey, Bismarck, ND. Water Resources Div.
Water-Data Report ND-77-1, June 1978. 512 p, 6 fig.

Descriptors: *North Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 131 gaging stations; stage and contents for 13 lakes and reservoirs; water quality for 49 gaging stations, 13 partial-record stations, 12 lakes, and 27 wells; and water levels for 33 observation wells. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in North Dakota. (Woodard-USGS)
W79-00643

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1977.
Geological Survey, Lincoln, NE. Water Resources Div.
Water-Data Report NE-77-1, June 1978. 459 p, 5 fig, 3 tab.

Descriptors: *Nebraska, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Nebraska consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 143 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 37 gaging stations, 19 ungaged stations, 30 partial-record flow stations, and 113 wells; and water levels for 68 observation wells. Also included are 115 crest-stage partial-record stations and 10 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nebraska. (Woodard-USGS)
W79-00644

FLOOD PLAIN INFORMATION: OGDEN RIVER, OGDEN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00669

FLOOD PLAIN INFORMATION: BOX ELDER CREEK, BRIGHAM CITY, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00670

FLOOD PLAIN INFORMATION: WOLF CREEK, LAWTON, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00671

FLOOD PLAIN INFORMATION: CHIKASKIA RIVER, BLACKWELL, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00672

FLOOD PLAIN INFORMATION: PROVO RIVER AND ROCK CANYON CREEK, PROVO-OREM, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-00673

FLOOD PLAIN INFORMATION: COODY CREEK, MUSKOGEE, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00674

FLOOD PLAIN INFORMATION: HAIKEY CREEK, TULSA COUNTY, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00675

FLOOD PLAIN INFORMATION: PRYOR CREEK AND SALT BRANCH, PRYOR CREEK, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00676

FLOOD PLAIN INFORMATION: STILLWATER CREEK AND TRIBUTARIES, STILLWATER, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-00677

ACCESS TO SCIENTIFIC INFORMATION THROUGH COMPUTERIZED INFORMATION SYSTEMS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10A.
W79-00684

GREAT LAKES WATER LEVELS 1974. DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
National Ocean Survey, Detroit, MI. Lake Survey Center.
May 1975. 106 p.

Descriptors: *Water levels, *Great Lakes, *Lakes, *Data collections, *Lake Superior, *Lake Ontario, *Lake Huron, *Lake Michigan, *Lake Erie, Daly hydrographs, Surface waters, Monthly, Surfaces, Frequency, Gages, Networks, Distribution, Distribution patterns, Stations, *Water surface elevations.

This publication contained Lake Survey Center Great Lake water-level gage records and showed in tabular form daily and monthly average levels for each gage in the network for the calendar year. It also contained in a separate table, the highest and lowest daily average for the month. In addition, a frequency distribution table of daily average levels showed the number of times each month the recorded levels were above a specified elevation. The gages record water levels in either analog or a digital form on strip charts that are retained for a period of 10 years. Recorded hourly values were used to compute the daily averages, and the monthly values were compiled from the daily averages. The location of the recording water-level gages was shown on preceding page. An index on the following pages listed the gage location, indentification number, and geographic coordinates. The stations are arranged by location and are in numerical order. All tabulated elevations are referred to International Great Lakes Datum (1955) and are expressed in feet. An explanation of the datum (IGLD) can be obtained by writing the Lake Survey Center. (See also W75-00509) (Froehlich-ISWS)
W79-00706

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME V. GRAVITY MONOLITHS AND U-FRAME LOCKS AND CHANNELS,
Army Engineer District, Walla Walla, WA. North Pacific Div.
For primary bibliographic entry see Field 8B.
W79-00708

OCCURRENCE, QUALITY, AND AVAILABILITY OF GROUND WATER IN JONES COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 2F.
W79-00709

CALCULATION OF DAILY GROUNDWATER LEVELS IN SWAMPS USING METEOROLOGICAL DATA,
For primary bibliographic entry see Field 4B.
W79-00715

U.S. ARMY CORPS OF ENGINEERS FIFTH HYDROGRAPHIC SURVEY CONFERENCE.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W79-00766

WILDERNESS WATER QUALITY: BISHOP CREEK BASELINE STUDY, 1974,
California Univ., Los Angeles. Environmental Science and Engineering.
For primary bibliographic entry see Field 5G.
W79-00859

ENVIRONMENTAL DATA MANAGEMENT: THE IDENTIFICATION OF OUTLIERS,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-00863

GALERKIN METHOD FOR A NON-LINEAR PARABOLIC EQUATION WITH MIXED NON-LINEAR BOUNDARY CONDITIONS,
California Univ., Santa Barbara. Coll. of Engineering.
For primary bibliographic entry see Field 2G.
W79-00900

COMPUTER ANALYSIS OF THE WATER BUDGET OF THE PROPOSED OAK OPENINGS NEW TOWN, LUCAS COUNTY, OHIO,
Toledo Univ., OH.
For primary bibliographic entry see Field 4C.
W79-00902

EMERGENCY WATER ALLOCATION LITERATURE: SOURCES AND RETRIEVAL,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00924

EWAP DATA ACCESS SYSTEM - A MANUAL FOR THE USE OF THE EDGE PUNCH CARD FILE,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00925

8. ENGINEERING WORKS

8A. Structures

CONDITION SURVEY OF LOCK AND DAM 52, OHIO RIVER,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
B. J. Houston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 804, Price codes: A06 in paper copy, A01 in microfiche. Miscellaneous Paper C-74-5, April 1974. 106 p, 44 fig, 2 tab, 6 append.

Descriptors: *Locks, *Dams, *Piers, *Ohio River, *Surveys, Concrete, Structures, Concrete structures, Hydraulic structures, Dam failure, On-site investigations, Photography, Boreholes, Inspection, Structural analysis, Damages, Civil engineering.

A program to conduct a condition survey of Lock and Dam 52, which is located on the Ohio River near Paducah, Kentucky, was authorized and funded by the Army Engineer District, Louisville, in June 1972. Lock and Dam 52 was constructed approximately 45 years ago. The purpose of this investigation was to determine the general condition of the structure so that effective plans could be made to accomodate present and future river traffic. The Army Engineer Waterways Experiment Station was contracted to conduct a part of the investigation, including a crack survey, borehole camera studies in drilled holes, underwater television camera crack studies, and sonic studies of the stucture. The Ohio River Division Laboratory (ORDL) conducted physical tests and a petrographic examination of drilled concrete cores. Results of ORDL's tests also were included in this report. The results of the investigations indicated that the concrete in the underwater sills, the piers, and the fixed weir is free from any deleterious chemical reactions. No silica-gel deposits, reaction rims, fractures, or other signs of distress due to alkali-aggregate reaction were found. Cracking of the concrete was extensive, but not excessive, and apparently can be attributed to such physical causes as freeze-thaw cycles of the exposed concrete, normal shrinkage, and foundation problems. (Sims-ISWS)
W79-00710

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF LOCKS AND DAM 3, MONONGAHELA RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
C. E. Pace, R. L. Stowe, and A. D. Buck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 904, Price codes: A16 in paper copy, A01 in microfiche. Miscellaneous Paper C-76-9, August 1976. 371 p, 98 fig, 8 tab, 7 ref, 7 append.

Descriptors: *Locks, *Dams, *Surveys, Inspection, Structural analysis, Structures, Concrete structures, Concrete, Hydraulic structures, Dam failure, Damages, On-site investigations, Photography, Boreholes, Civil engineering, *Monongehela River.

The results of an engineering condition survey and a structural analysis of Locks and Dam 3, Monongahela River, were given. External cracking of the concrete in the lock walls is extensive. Many horizontal and vertical cracks, although isolated and not fitting into a total failure picture, can result in localized failures, especially in critically stressed regions. The outer 2 to 6 ft of concrete as described in the core and photo logs are highly deteriorated. The same condition probably exists in the outer surface of the walls to lower pool. The internal concrete is generally of adequate strength for current design criteria. One exception is a small zone in the downstream gate monolith of the middle wall; a compressive strength of 1150 psi was obtained on the concrete from this zone. The concrete is in a critically stressed area; immediate remedial action was recommended. Pressure grouting as an interim measure was suggested. There is one possible continuous crack in gate monolith R-23; it runs for a depth of 35 ft and possibly extends for two-thirds of the monolith to the riverside. It was recommended that a study be initiated immediately to evaluate rehabilitation or replacement of Locks and Dam 3 on the Monongahela River. (Sims-ISWS)
W79-00712

CAPACITY STUDIES OF GALLIPOLIS LOCKS, OHIO RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. L. Daggett, and R. W. McCarley.
Technical Report H-78-6, May 1978. 166 p, 4 append, 45 tab, 29 fig, 5 ref.

Descriptors: *Ohio River, *Locks, *Inland waterways, Model studies, *Gallipolis Locks and Dam(WV), West Virginia.

Includes the results of an investigation to determine the physical capacity of the existing Gallipolis Locks, considering both operational and minor structural changes that could improve the locking efficiency. Several alternative operating policies, some requiring structural improvements, were analyzed and compared by employing the computerized TOWGEN/WATSIM (tow generator/waterway simulator) model package. Some proposed improvements were analyzed through the use of hand-computational and/or graphical techniques. The prototype data used in the investigation were collected and summarized through the Performance Monitoring System (PMS) of the Corps of Engineers Inland Navigation Systems Analysis (INSA program. The report includes discussions of the data formats required by the model, calibration of the model, and analysis of model output. A number of capacity curves are presented to show the relation between increasing commodity tonnage, two delays, and lock utilization. Lock capacity levels, interms of tonnage per month and tonnage per year, are tabulated for convenient comparison of all potential operational and structural improvements. Appendix A presents file identification codes for use wth WATSIM, and Appendix B contains a comparison of October and December 1975 PMS data taken at Gallipolis Locks and Dam. (WES)
W79-00762

8B. Hydraulics

AN OPEN-COAST MATHEMATICAL STORM SURGE MODEL WITH COASTAL FLOODING FOR LOUISIANA; REPORT 1, THEORY AND APPLICATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. J. Wanstrath.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A053 365, Price codes: A06 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-5, February 1978 (Report 1 of a series). 102 p, 13 tab, 39 pl, 22 ref, append.

Descriptors: *Storm surge, *Mathematical models, *Waves(Water), *Louisiana, Hydrodynamics, Computer programs, Model studies.

A two-dimensional time-dependent, open-coast, long-wave, shallow-water model is presented. The model employs an orthogonal curvilinear coordinate system with telescoping computing cells. This permits greater resolution of the wave in the nearshore coastal region where principal interest is focused rather than at the continental shelf break or at far lateral distances from the region. The model treats the coastline as a finite height barrier which is broken with bay entrances. Coastal overtopping and bay communication with the open sea provide the means for the transport of water across the nominal coastline. Mass is conserved with all water lost from the ocean during the flood stage being stored in discrete bay ponding areas. Each ponding area is described by its particular storage area curve and its particular series of coastline computing grid segments. A prediction/correction method is employed for the computation of the coastal water level. The model has been employed in various tide and storm surge studies. In particular, surge results are presented from four historical hurricanes that affected the Louisiana coast. (WES)
W79-00537

GEORGETOWN HARBOR, SOUTH CAROLINA; REPORT 1, HYDRAULIC SALINITY, AND SHOALING VERIFICATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. J. Trawle.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A052 340, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-6, (Rept. 1 of a series), February 1978. 173 p, 46 tab, 98 pl.

Descriptors: *Salinity, *Tides, *Hydraulic models, Model studies, *Current velocity, *Shoaling, *Georgetown Harbor(SC), Navigation channels.

The Georgetown Harbor model, a fixed-bed model constructed to linear scale ratios of 1:800 horizontally and 1:80 vertically, reproduced a portion of the Atlantic Ocean, Winyah Bay including Mud Bay, North Inlet and marshes between Winyah Bay and North Inlet, the Sampit River including Georgetown Harbor, and the lower portions of the Pee Dee, Black, and Waccamaw Rivers and adjacent marshes. The model was equipped with necessary appurtenances for the accurate reproduction and measurement of tides, tidal currents, salinity instrusion, freshwater inflow, and shoaling distribution. Model verificantion tests, presented in this report, were conducted to ensure that the model hydraulic, salinity and shoaling characteristics were in satisfactory agreement with those of the prototype. The agreements attained between model and prototype were considered satisfactory for the types of tests conducted in the model. The purposes of the model study were (1) to determine the effects on the hydraulic, salinity, and shoaling characteristics of a deepening from 27 to 35 ft of the main navigation channel to Georgetown Harbor and (2) to determine if present maintenance dredging can be reduced by proposed plans involving channel revisions, sediment traps, and freshwater flow diversion. These studies will be reported in later reports.
W79-00540

NAVIGATION CONDITIONS AT ALICEVILLE LOCK AND DAM, MISSISSIPPI AND ALABAMA, TOMBIGBEE RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. J. Shows, and J. J. Franco.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A054 414, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-78-2, April 1978. 84 p, 7 tab, 5 photos, 31 pl.

Descriptors: *Hydraulic models, *Navigation, Model studies, Mississippi, Alabama, *Tombigbee River(Miss), *Tennessee-Tombigbee Waterway, *Aliceville Lock and Dam(Ala), *Navigation conditions, *Fixed-bed models.

A Fixed-bed model reproducing about 2.8 miles of the Tombigbee River channel and Adjacent overbank was used to determine navigation conditions with the proposed design for the Alicevill Lock and Dam ad to develop any modifications required to eliminate conditions that would adversely affect navigation using the lock. The model was also used to determine conditions that might be expected during construction of the lock and dam with the proposed construction plan. Results revealed the following: (a) satisfactory navigation conditions in the upper lock approach could be developed with modification of the excavation along the left bank of the approach channel and excavation of the right bank in the bend near the upper end of the approach channel; (b) navigation conditions in the lower lock approach could be improved considerably with a dike angled riverward along the right side of the approach channel; (c) two-way traffic in the second bend uspstream of the upper lock approach would be difficult and hazardous during the higher flow; (d) recommended changes to the original plan would have little effect on water-surface elevations in the reach or on conditions that could be expected during construction of the lock and dam.
W79-00541

IMPROVEMENTS FOR MURRELLS INLET SOUTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
F. C. Perry, Jr., W. C. Seabergh, and E. F. Lane.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A054 242, Price codes: A15 in paper copy, A01 in microfiche. Technical Report H-78-4, April 1978. 339 p, 55 tab, 73 photos, 143 pl, 7 ref.

Descriptors: *Bypasses, *Jetties, South Carolina, *Tidal inlets, *Murrells Inlet(SC), *Channel stabilization.

Murrells Inlet is a natural channel through a sandy beachline that conducts tidal flows between the Atlantic Ocean and a well-mixed lagoon of ocean salinity which has no source of freshwater inflow other than local surface runoff. The inlet provides passage from the ocean to docking facilities for boats. However, due to the influx of sand into the inlet, shallow shifting-sand shoals and breaking waves produce difficult and dangerous navigation conditions. A project for the improvement and stabilization of the inlet was authorized in 1971. A model study was performed to aid in the design of structural solutions to the problem of providing a stabilized channel of sufficient depth and width with provisions for sand bypassing. The model study examined a variety of plans in order to optimize the alignment and spacing of jetties and the proper alignment of interior channels with respect to current patterns. Also, the effects of the plans on bay tidal elevations and tidal currents were determined as were the effects on wave heights. Model testing concluded that plan 1H was the optimal plan for providing a stable entrance channel while providing for sand bypassing. (WES)
W79-00546

MODELING OF HYDRAULIC SYSTEMS BY FINITE-ELEMENT METHODS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2A.
W79-00634

CHANNEL ROUTING BY FINITE DIFFERENCE METHOD,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
Y. H. Huang.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Proceedings Paper 14088. p 1379-1393, October 1978. 9 fig. 8 ref.

Descriptors: *Channel flow, *Model studies, *Channels, Flood routing, Finite element analysis, Hydrographs, Kinetics, Routing, Watersheds(Basins), Streams, Computer models, Channeling, *Finite difference models, Kentucky watershed model.

A finite difference model that can be incorporated easily into a watershed model was presented for flood routing through natural stream channels. The advantages of the method lie not only in its simplicity, but also in the ease with which channel data can be determined from topographic maps. The required input on discharge-flow area relationship can be computed by Manning's formula or obtained directly from the water surface profile computer programs. Both the linear and nonlinear methods of channel routing were described. It was found that linear routing is unconditionally stable and yields good results if the time increment is kept sufficiently small. The use of smaller time increments not only reduces the discrepancy between linear and nonlinear routings, but also gives more consistent results when different input data are used to characterize the discharge-flow area relationship. The method was incorporated into MOPSET, a self-calibrating Kentucky Watershed Model, and found to be satisfactory. (Lee-ISWS)
W79-00704

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME V. GRAVITY MONOLITHS AND U-FRAME LOCKS AND CHANNELS,
Army Engineer District, Walla Walla, WA. North Pacific Div.
N. W. Wilke, C. M. Hargett, and J. W. Simmons.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 247, Price codes: A06 in paper copy, A01 in microfiche. Volume 5 of the Proceedings of a Conference held Sept 22-26, 1975, New Orleans, LA., Army Engineer Waterways Experiment Station, Vicksburg, Miss., Aug 1976. 98 p, 15 fig, 19 ref, 3 append. N. Radhakrishnan, editor.

Descriptors: *Computer programs, *Dams, *Locks, *Channels, Conferences, Model studies, Mathematical models, Design, Structural design, Structural models, Computer models, Construction, Hydraulic structures, Engineering, Civil engineering, *Computer-aided design, U-frame channels, U-frame locks, Monoliths.

G M: Gravity monoliths are used for dams, navigation locks, and retaining walls. The structural design of gravity monoliths includes evaluation of foundation conditions and spillway and freeboard requirements and the application of loadings to determine stability against sliding, overturning, and internal stress conditions. Loads are determined as directed by EM's 1110-2-2200, -2400, -2502, and -2602. Loadings include weight of the structure, water, uplift, silt and fill, wind, wave, ice, and seismic and construction loads. U-F L: Navigation locks improve river navigation by decreasing river gradients and increasing water depths. Although U-frames allow greater diversity in design and placement, gravity monoliths, because of their simplicity in design and construction, have been used in the United States almost to the exclusion of the U-frame monolith. U-frames have, however, been used successfully by the Corps. U-F C: At least nine different computer programs were used by the Corps of Engineers in the analysis and design of U-frame channels. This report gave program abstracts and evaluations of five of them. The report also offered a few comments on the present state of Corps use of computer programs for design of U-frame channels. (Sims-ISWS)
W79-00708

BICYCLE-SAFE GRATE INLETS STUDY. VOLUME I - HYDRAULIC AND SAFETY CHARACTERISTICS OF SELECTED GRATE INLETS ON CONTINUOUS GRADES,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
P. H. Burgi, and D. E. Gober.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 510, Price codes: A13 in paper copy, A01 in microfiche. Report FHWA-RD-77-24, June 1977. 285 p, 170 fig, 34 tab, 14 ref, 2 append. DOT PO-5-3-0166.

Descriptors: *Drains, *Storm drains, *Urban runoff, *Hydraulics, Laboratory tests, Runoff, Storm runoff, Surface runoff, Inlets(Waterways), Drainage, Efficiencies, Safety, Design, Equipment, *Bicycle safety, *Grate inlets, Drainage design, Debris.

Eleven drain inlet grates were tested to evaluate their safety characteistics for bicycle as well as pedestrian traffic. Four of the grates that rated highest in the safety tests were selected for hydraulic testing. Three other grates with designs and bar spacings similar to grates proven safe also were selected for hydraulic testing. A parallel bar grate was included in the hydraulic test program as a standard with which to compare the performance of the other tests grates. Hydraulic and debris tests were performed on full-size grates in sizes of 2 ft by 4 ft (0.61 m by 1.22 m) and 2 ft by 2 ft (0.61 m by 0.61 m). The grates were tested at cross slopes of 1:48, 1:24, 1:16 and longitudinal slopes of 0.5, 1, 2, 4, 6, 9, and 13%, with gutter flows up to 5.6 cu ft/s (0.158 cu m/s). Debris tests were run using 150 pieces of 3 inch by 4 inch paper debris. Test results showed that two of the grate designs (a cast and a steel fabricated grate) are nearly as hydraulically efficient as the parallel bar grate and considerably more efficient than the other grate designs tested. One other design (a steel fabricated grate) showed high hydraulic efficiencies at longitudinal slopes up to 6%. These three grate designs were recommended for additional testing. A grate's ability to handle debris without clogging was shown to be most dependent on the spacing of its longitudinal bars. Grates with the widest longitudinal bar spacings tested consistently outperformed grates with narrower longitudinal bar spacings. (Sims-ISWS)
W79-00714

PRELIMINARY EVALUATION OF WIND AND WAVE EFFECTS AT POTENTIAL LNG TERMINAL SITES, STATE OF CALIFORNIA: APPENDIX A: AN EVALUATION OF THE RELATIVE WAVE CLIMATE AT FIVE ONSHORE LNG SITES CONSIDERING ISLAND INFLUENCES AND TOPOGRAPHIC EFFECTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. Z. Hales.
Miscellaneous Paper H-78-2, April 1978. 553 p, 21 tab, 8 ref, 2 addendum.

Descriptors: *Waves(Water), *Refraction(Water waves), *California, *Winds, Topography, *Wave heights, *Liquefied Natural Gas terminal sites, Wind waves.

Evaluates the wave climate at alternate potential Liquefied Natural Gas (LNG) terminal sites by applying existing hindcast wave data of a general nature to obtain estimates of the times of excessive wave conditions at various sites. Also, analyzes the effects of island sheltering and topographic influences on the wave climate at five onshore shites for a more refined estimate of wave conditions. Because of questions involving the development of the deepwater hindcast wave data used and indications of conflicting evidence, this analysis is only a relative evaluation and should not be interpreted as projections of actual downtime, but

rather as a consistently uniform basis for comparison. It was determined that the wave climate at Rattlesnake Canyon is statistically significantly greater than those sites of Point Conception, and the remaining onshore sites are not statistically significantly different from each other. Because of the sheltering effect of the offshore islands and the physically shielding orientation of the southern California coastline from the severe northwest wave climate, any of the proposed onshore sites south of Point Conception appear to be viable potential LNG terminal sites in the absence of additional protective structures. (WES)
W79-00756

MODEL STUDIES OF THE PORTUGUES AND BUCANA RIVERS CHANNELIZATION, PUERTO RICO; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
N. R. Oswalt.
Technical Report H-78-3, May 1978. 86 p, 23 photo, 44 pl.

Descriptors: *Puerto Rico, *Bucana River, *Channel improvement, *Drops(Structures), *Flood control, *Hydraulic models, *Portugues River, *Bucana River.

Two 1:30-scale physical hydraulic models of the Portugues and Bucana Rivers were used to determine the adequacy of the original designs for the flood control channelization project through the city of Ponce, Puerto Rico. The proposed channelization included trapezoidal to rectangular channel transitions, stilling basins, and drop structures in the high-velocity channels. Test results indicated the original design with certain modifications would effectively transmit all expected flood releases from the proposed Portugues and Cerrillos Dams. Modifications to transitions at entrances to the high-velocity channel reaches were streamlined within the original right-of-way to reduce surface turbulence and standing waves. Geometry of the original stilling basins was atered to prevent the oblique hydraulic jumps and the end-sill heights were lowered to reduce the water-surface drawdown, surface roller waves, and high bottom velocities downsstream of each basin. the original design Bucana Channel drops structures were recommended for the prototype because the preventive measures required to eleiminate the tendency for eddying near design flows created additional problems and cost. Two riprap plans were developed for the four Bucana drop structures. Modification to the Portugues stilling basins were recommended based on the results of the Bucana stilling basin test. (WES)
W79-00761

EFFECT OF DEPTH ON DREDGING FREQUENCY; REPORT 1, SURVEY OF DISTRICT OFFICES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W79-00767

AN EXPERIMENTAL STUDY OF FLOW AND OXYGEN TRANSFER IN CIRCULATION INDUCED BY AIR BUBBLE PLUMES,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2E.
W79-00856

8D. Soil Mechanics

INVESTIGATION OF THE LIQUEFACTION POTENTIAL AT THE W.G. HUXTABLE PUMPING PLANT SITE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
W. F. Marcuson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 497, Price codes: A05 in paper copy, A01 in microfiche. Misscellaneous Paper S-76-8, April 1976. 87 p, 23 fig, 3 tab, 8 ref, 4 append.

Descriptors: *Sands, *Soils, *Soil stability, *Foundations, Soil physical properties, Soil density, Sampling, Cores, Earthquakes, Loads(Forces), Soil profiles, Laboratory tests, X-ray analysis, Sieve analysis, Stress, Depth, Liquefaction(Soils), Cyclic triaxial loading.

The site of the W.G. Huxtable Pumping Plant, located on the banks of the Mississippi River 60 miles south of Memphis, Tennessee, was investigated with regard to liquefaction potential. Cyclic triaxial compression tests were performed on remolded samples at various densities. An analysis was made using Seed's Simplified Procedure. As a result of this analysis, the structural excavation will be carried to a depth of approximately 47 ft. The exposed foundation is to be treated by compaction and soil stabilization techniques. (Visocky-ISWS)
W79-00713

8F. Concrete

CONDITION SURVEY OF LOCK AND DAM 52, OHIO RIVER,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8A.
W79-00710

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF LOCKS AND DAM 3, MONONGAHELA RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8A.
W79-00712

8I. Fisheries Engineering

EVALUATION OF RECIRCULATING SYSTEMS FOR THE CULTURE OF CHANNEL CATFISH,
Memphis State Univ., TN. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W79-00682

CULTURE OF CHANNEL CATFISH IN A HIGH FLOW RECIRCULATING SYSTEM,
Memphis State Univ., TN. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W79-00683

ENTRAINMENT AT A ONCE-THROUGH COOLING SYSTEM ON WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Inst. of Water Research; and Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W79-00878

A VERSATILE PUMP-SAMPLER FOR LIVE ZOOPLANKTON,
Central Electricity Generating Board, Southampton (England). Marine Lab.
For primary bibliographic entry see Field 7B.
W79-00949

EVALUATION OF AN AIR BUBBLER TO MITIGATE FISH IMPINGEMENT AT AN ELECTRIC GENERATING PLANT,
Texas Instruments Inc., Buchanan, NY.
For primary bibliographic entry see Field 5G.
W79-00950

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT 1976-1977.
Hawaii Univ., Honolulu. Water Resources Research Center.
(1977). 66 p, 1 tab.

Descriptors: *Water resources, *Water pollution, *Hydrology, *Water management, *Waste disposal, *Hawaii, Ecology, Meteorology, Biological pollution, Groundwater, Irrigation, Eutrophication, Groundwater movement, Recycling, Urbanization, Flooding, Water quality, Water conservation, Waste water treatment, Viruses, Algae, Waste water disposal, Sewage.

Twenty-six research projects dealing with water problems of Hawaii were carried out during the fiscal year 1976-1977. Each of these was summarized and a brief discussion of project objectives, research accomplishments, and applications was included. Meteorological studies focused on analyses of high intensity rainfall data and satellite imagery for investigation of mesoscale rainfall regimes. A variety of projects were carried out in the area of water pollution including studies on pollutants, such as heavy metals, carcinogens, and viruses. Waste disposal problems were addressed in reports on cesspool leachates, land disposal at the Kaneohe Marine Corps Air Station, rotating disc sewage treatment systems for suburban developments, and recycling sewage water by irrigation of sugar cane. The biological aspect of waste disposal was represented by research and algal growth potential of waste effluents, biological monitoring of a sewage outfall, and a survey of pathogenic enteric viruses in Hawaiian ocean environment. Topics related to water conservation and management included watershed monitoring studies, groundwater budget and coastal discharge, infiltration characteristics of selected Hawaiian land types, and urban flood hydrology. Other projects lay in the fields of information transfer, ecological evaluation of a coral reef ecologic system, eutrophication of Lake Wilson, and a hydraulic device for opening sediment plugs in Oahu stream mouths. A list of technical reports and memoranda and contributions of the technical staff to other publications concludes the report. (Majetnyi-IPA)
W79-00883

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

ACCESS TO SCIENTIFIC INFORMATION THROUGH COMPUTERIZED INFORMATION SYSTEMS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. M. White.
Progressive Agriculture in Arizona, Vol. 28, No. 3, p 10-12, May-June, 1975. OWRT A-042-ARIZ(7), 14-31-0001-3803.

Descriptors: Computers, *Information retrieval, *Information exchange, Automation, Documentation, Publications, Bibliographies, United States, Southwest U.S., Arizona, Water resources, Natural resources, Agriculture, Bibliographic searches, Information systems, Literature searches.

Literature is proliferating in the fields of science (i.e., each year over 400,000 articles appear in major journals and periodicals). It is increasingly difficult for an individual to delve into the literature and extract information on some topic of interest. Computer based information systems are increasingly being used to help scientists, researchers, laymen, and students to identify appropriate documents. These systems have been developed by governmental agencies and departments, by abstracting and indexing companies, by national or regional libraries, by professional societies, by universities, by public libraries, or by private businesses. If they are bibliographic information systems, they provide for the user either references or references and document copies. Six computer based systems--chosen because of their general usefulness to persons in agriculture and natural resources in Arizona are described. The systems are: the National Agricultural Library's CAIN, the Office of Water Resources Research's WRSIC, the Smithsonian Science Information Exchange, the National Technical Information Service, The Arid Lands Information System, and the Watershed Management Information System. For each, information is given on the developing organization, scope of the system, type of product, and contact source. Hopefully, this information will help direct potential users to an appropriate system.
W79-00684

10C. Secondary Publication And Distribution

THE EXPLOITATION OF EXTRACTIVE RESOURCES: A SURVEY,
For primary bibliographic entry see Field 6B.
W79-00584

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W79-00912

EMERGENCY WATER ALLOCATION LITERATURE: SOURCES AND RETRIEVAL,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 4A.
W79-00924

A REVIEW OF THE BIOLOGY OF BRITISH NAIDIDAE (OLIGOCHAETA) WITH EMPHASIS ON THE LOTIC ENVIRONMENT,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W79-00971

WATER CONSERVATION INFORMATION DISSEMINATION DURING 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-01000

10D. Specialized Information Center Services

ACCESS TO SCIENTIFIC INFORMATION THROUGH COMPUTERIZED INFORMATION SYSTEMS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10A.
W79-00684

WATER CONSERVATION INFORMATION DISSEMINATION DURING 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-01000

10F. Preparation Of Reviews

THE PRODUCTION BIOLOGY OF EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM L.): A REVIEW,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W79-00768

SUBJECT INDEX

ABALONE
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

ABSORPTION
Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

ABSORPTION FREEZING VAPOR COMPRESSION
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

ACHELIA
Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

ACID BOG LAKES
In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-00990 5C

ACID LAKES
Acid Lake Renovation,
W79-00576 5G

ACID MINE WATER
Acid Lake Renovation,
W79-00576 5G

ACID POLLUTED WATERS
Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

ACREAGE
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

ACTIVATED CARBON
Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

ACTIVATED SLUDGE
Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

ACTIVATION ENERGY
Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

ADAPTATION
Acute Toxicity of Copper to a Copepod,
W79-00959 5C

Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

ADMINISTRATIVE AGENCIES
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

ADMINISTRATIVE DECISIONS
Florida Coastal Zone Management: An Analysis,
W79-00602 6E

ADMIRALTY GULF (AUSTRALIA)
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

ADSORPTION
Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

AERATION
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

Effects of Aeration in Earthen Ponds on Water Quality and Production of White Catfish,
W79-00973 5C

AERIAL PHOTOGRAPHY
Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

AERIAL SURVEYS
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

AESTHETICS
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

AFFINITY TESTS
Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

AGRICULTURAL RUNOFF
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

AGRICULTURE
The Economic Realities of Drought,
W79-00582 6B

Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

AIR BUBBLE PLUMES
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

AIR POLLUTION
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

ALASKA
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume I.
W79-00895 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume II.
W79-00896 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume III.
W79-00897 6G

Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

Environmental Assessment of the Alaskan Continental Shelf. Volume I.
W79-00998 6G

ALASKA

Environmental Assessment of the Alaskan Continental Shelf. Volume II.
W79-00999 6G

ALBURNOIDES-BIPUNCTATUS
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

ALGAE
Antiviral Substances from California Marine Algae,
W79-00590 3C

Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

ALGAL CONTROL
Biological Control of Blue-Green Algae,
W79-00509 5A

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

ALGICIDES
Biological Control of Blue-Green Algae,
W79-00509 5A

Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

ALICEVILLE LOCK AND DAM (ALA)
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

ALIPHATIC COMPOUNDS
Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

ALKALINE WATER
Phytoplankton of Alkaline Waters at Kanem (Chad): VII. The Structure of Populations, (In French),
W79-00884 5C

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

ALKANES
A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

ALLOGROMIA LATICOLLARIS
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

ALTERATION OF FLOW
Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

ALTERNATIVE PLANNING
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

ALTERNATIVE WATER USE
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

AMERICAN SAMOA
Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

AMMONIA
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

AMOCO CADIZ OIL SPILL
The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

AMPHIPODA
Individual and Combined Toxicity of Some Petroleum Aromatics to the Marine Amphipod Elasmopus Pectenicrus,
W79-00963 5C

ANALOG MODELS
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

ANALYSIS
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

ANALYTICAL TECHNIQUES
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

ANIMAL DISEASES
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

ANIMAL METABOLISM
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

ANION EXCHANGE
Preparation of Ion-Exchange Membranes with Extremely Low Areal Resistances.
W79-00904 3A

ANNELIDS
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

ANTARCTIC
The Iceberg Cometh.: International Law Relating to Antarctic Iceberg Exploitation,
W79-00603 6E

Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

ANTIBIOTICS
Effects of Water Quality, Antibiotics, Phytoplankton and Food on Survival and Development of Larvae of Scylla Serrata (Crustacea:Portunidae),
W79-00891 5C

ANTIMONY
Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

ANTIMYCIN
Effects of Antimycin on Stream Insects,
W79-00525 5C

APPROXIMATION METHODS
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

AQUATIC ALGAE
Biological Control of Blue-Green Algae,
W79-00509 5A

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

AQUATIC ANIMAL
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

AQUATIC BACTERIA
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

AQUATIC ENVIRONMENT
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

Ocean Deserts and Ocean Oases,
W79-00817 5G

AQUATIC HABITATS
Habitat Structure and Stream Fish Communities,
W79-00940 2I

AQUATIC INSECTS
Effects of Antimycin on Stream Insects,
W79-00525 5C

AQUATIC LIFE
Environmental Assessment of the Alaskan Continental Shelf. Volume I.
W79-00998 6G

AQUATIC PLANT
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

AQUATIC PLANTS
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

AQUATIC WEED CONTROL
Biological Control of Aquatic Weeds with Plant Pathogens,
W79-00534 4A

Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

Chemical Control of Hydrilla,
W79-00776 5G

Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

AQUATIC WEEDS
Aquatic Forage Processing in Florida,
W79-00531 4A

Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

AQUIFER CHARACTERISTICS
Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

AQUIFERS
Dolomitization in the Floridan Aquifer,
W79-00532 2F

ARCTIC
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

ARCTIC COASTAL PLAIN
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

AREAS OF ENVIRONMENTAL CONCERN
State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

ARGO MERCHANT OIL SPILLS
Crisis Science: Investigations in Response to the Argo Merchant Oil Spill,
W79-00929 5C

ARID LANDS
Desertification and Technological Adjustment in the Murray Mallee of South Australia,
W79-00807 3B

Management of Brackish Waters in Arid Land Agriculture: Modern Experiences with Ancient Problems,
W79-00810 3C

Land Tenure and Desertification in Australia's Arid Lands,
W79-00811 6E

The Evolution of the Australian Deserts,
W79-00815 4A

Strategy for the Development and Management of Deserts.
W79-00818 4A

Desertification of Australia in Its Global Context,
W79-00819 6G

ARMY CORPS OF ENGINEERS
The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

AROMATIC COMPOUNDS
Individual and Combined Toxicity of Some Petroleum Aromatics to the Marine Amphipod Elasmopus Pectenicrus,
W79-00963 5C

AROMATIC HYDROCARBONS
Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

ARSENATE
The Effects of Arsenate and Arsenite on the Growth and Morphology of the Marine Unicellular Algae Tetraselmis Chui (Chlorophyta) and Hymenomonas Carterae (Chrysophyta),
W79-00960 5C

ARSENIC
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

ARSENIC COMPOUNDS
The Effects of Arsenate and Arsenite on the Growth and Morphology of the Marine Unicellular Algae Tetraselmis Chui (Chlorophyta) and Hymenomonas Carterae (Chrysophyta),
W79-00960 5C

ARSENITE
The Effects of Arsenate and Arsenite on the Growth and Morphology of the Marine Unicellular Algae Tetraselmis Chui (Chlorophyta) and Hymenomonas Carterae (Chrysophyta),
W79-00960 5C

ARTIFICIAL RECHARGE
Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

ARTIFICIAL SUBSTRATES
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

ASCOPHYLLUM NODOSUM
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

ASELLUS
Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

ASHIPPUN RIVER (WISC)
Effects of Antimycin on Stream Insects,
W79-00525 5C

ATLANTIC COASTAL PLAINS
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

ATMOSPHERE
Availability of Atmospheric Water,
W79-00685 2B

ATMOSPHERIC PRESSURE
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

ATTITUDES
The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

AUSTRALIA
Salinisation in the Southwest of Western Australia,
W79-00803 3C

Desertification and Technological Adjustment in the Murray Mallee of South Australia,
W79-00807 3B

Land Tenure and Desertification in Australia's Arid Lands,
W79-00811 6E

Waterlogging and Salinisation in Irrigated Semi-Arid Regions of NSW,
W79-00812 3C

Desertification in the Pastoral Rangelands of the Gascoyne Basin, Western Australia,
W79-00814 3F

The Evolution of the Australian Deserts,
W79-00815 4A

Desertification of Australia in Its Global Context,
W79-00819 6G

AUSTRALIA (VICTORIA)
Studies on a Saline Lake Ecosystem,
W79-00734 2H

AUTOMOTIVE EMISSION
A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

AVIAN CHLOREA
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

AVON RIVER (ENGLAND)
A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

BACTERIA
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: II. Incubation Time (In Spanish),
W79-00580 5A

BACTERIOLOGICAL STUDIES
Bacteriological Investigations of Sea Water along the Dutch Coast: 1971 and 1972, (In German),
W79-00737 5C

BAFFIN ISLAND (CANADA)
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

BALTIC SEA
Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

BARNES ICE CAP
Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

BARRIER ISLANDS
Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

BARRIERS
Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

BASELINE STUDIES
Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

DOMES Upper Water Physical Oceanography, A Component of the DOMES Program,
W79-00885 5B

Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

The MESA Puget Sound Project, Seattle, Washington. FY76-Annual Report.
W79-00888 2L

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume I.
W79-00895 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume II.
W79-00896 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume III.
W79-00897 6G

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

Environmental Assessment of the Alaskan Continental Shelf. Volume I.
W79-00998 6G

Environmental Assessment of the Alaskan Continental Shelf. Volume II.
W79-00999 6G

BASS
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

BATHYMETRY
U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

BAYS
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

BEAUFORT SEA (ALASKA)
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

BENEFITS
What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

BENTHIC COMMUNITIES
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

BENTHIC FAUNA
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

BENTHOS
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

BIBLIOGRAPHIES
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

BICYCLE SAFETY
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

BIOACCUMULATION
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

BIOASSAY
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

BIOCHEMICAL OXYGEN DEMAND
Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

BIOCHEMISTRY
The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

BIOCLIMATOLOGY
Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

BIOCONTROL
Biological Control of Aquatic Weeds with Plant Pathogens,
W79-00534 4A

The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

BIODEGRADATION
Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

BIOINDICATORS
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

BIOLOGICAL COMMUNITIES
Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

BIOLOGICAL EFFECTS
The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

BIOLOGICAL TREATMENT
Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

Activated Sludge Treatment of Wastewater,
W79-00839 5D

BIOMAGNIFICATION
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

BIOMASS
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

BIOTOPES
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

BIRDS
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Oiled Seabird Rescue and Conservation,
W79-00740 5G

Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

BISHOP CREEK (CALIF)
Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

BLEACHING WASTES
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

BOGS
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-00990 5C

BOND ISSUES
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

BORROW PITS
Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

BOSTON (MA)
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

BOTTOM SAMPLING
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

BOTTOM SEDIMENTS
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

BOX ELDER CREEK (UT)
Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

BRACKISH WATER
Management of Brackish Waters in Arid Land Agriculture: Modern Experiences with Ancient Problems,
W79-00810 3C

BRIDGEPORT (CT)
Harbor and Waterfront Development Planning,
W79-00657 2L

BROMINE
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

BROMINE

Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

BROMINE CHLORIDE (BRCL)
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

BROMOCHLORINATED SEAWATER
Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

BUCANA RIVER
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

BUFFER STRIPS
The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

BUZZARDS BAY (MASS)
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

BY PRODUCTS
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

BYPASSES
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

BYRD STATION (ANTARCTICA)
Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

CADMIUM
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

CALCIUM IONS
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

CALIFORNIA
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques.
W79-00711 7B

Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

CANADA
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

CANAL CONSTRUCTION
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

CANAL DESIGN
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

CANALS
Several Problems of the Rational Construction and Exploitation of Reservoirs and Canals as Examplified by the Uchinskoye Reservoir and the Moscow Canal, (In Russian),
W79-00655 5G

CAPE COD (MA)
Cape Cod Water Quality Management Plan.
W79-00666 5G

CAPE FEAR RIVER (NC)
A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

CARBON
Detritus in the Lake Ecosystem,
W79-00552 5C

Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

CARBON DIOXIDE
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

CARBON RADIOISOTOPES
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

CARP
Ecological Studies of Fishponds in Chupei,
W79-00952 5C

The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

CATFISH
Effects of Aeration in Earthen Ponds on Water Quality and Production of White Catfish,
W79-00973 5C

CATION EXCHANGE
Preparation of Ion-Exchange Membranes with Extremely Low Areal Resistances.
W79-00904 3A

CATTLE
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

CAYUGA LAKE (NY)
The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

CEDAR CREEK BASIN (KAN)
Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

CHAD
Phytoplankton from Waters of Kanem (Chad): IX. The Application of Correspondence Fac-

torial Analysis to Population Studies, (In French),
W79-00849 2H

Phytoplankton of Alkaline Waters at Kanem (Chad): VII. The Structure of Populations, (In French),
W79-00884 5C

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

CHANNEL CATFISH
Evaluation of Recirculating Systems for the Culture of Channel Catfish,
W79-00682 5G

Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

CHANNEL EROSION
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

CHANNEL FLOW
Channel Routing by Finite Difference Method,
W79-00704 8B

Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

CHANNEL IMPROVEMENT
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

CHANNEL STABILIZATION
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

CHANNELS
Channel Routing by Finite Difference Method,
W79-00704 8B

Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

CHARA CONTRARIA
Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

CHEMCONTROL
Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

Chemical Control of Hydrilla,
W79-00776 5G

CHEMICAL ANALYSIS
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

CHEMICAL COMPOSITION
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

CHEMICAL INDUSTRY
Where Do Environmental Laws and Regulations Stand Today.,
W79-00607 5G

CHEMICAL PRECIPITATION
Removing Fluoride from Waste Water by Adding Calcium and Phosphate - and Precipitating Germs of Fluor:Apatite or Calcium Fluoride.
W79-00731 5D

CHEMICAL REACTIONS
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

Propylammonium Halide Starch Derivatives - Used as Flocculants, and in Textile and Paper Industries.
W79-00729 5D

CHEMICAL STRATIFICATION
In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-00990 5C

CHEMICAL WASTES
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Removing Fluoride from Waste Water by Adding Calcium and Phosphate - and Precipitating Germs of Fluor:Apatite or Calcium Fluoride.
W79-00731 5D

Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

CHEMICALS RECOVERY
Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

CHEMUNG LAKE (ONTARIO CANADA)
Environmental Effects of Mechanical Harvesting,
W79-00770 4A

CHIKASKIA RIVER (OK)
Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

CHILE
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

CHINA
Desert Transformation in China.
W79-00798 4A

CHIRONOMUS-PLUMOSUS
A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

CHLAMYDOMONAS
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

CHLORELLA PYRENOIDOSA
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

CHLORELLA VULGARIS
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

CHLORINATED HYDROCARBON PESTICIDES
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

CHLORINATION
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

CHLORINE
Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

CHLOROPHYLL
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

Ecological Studies of Fishponds in Chupei,
W79-00952 5C

CHLOROPHYTA
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

CHOLERA
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

CHROMADORINA GERMANICA
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

CHROMATOGRAPHY
Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

CHUNGMU BAY (KOREA)
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

CITIES
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

CITRUS COUNTY
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

CITRUS FRUITS
Nitrogen Fertilizer Management of a Lemon Orchard as Related to Nitrate-Pollution Potential of Ground Water,
W79-00899 5B

CLADOCERA
Zooplankton of the Region of Nosy-Be: V. Cladocera: Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W79-00809 5C

CLAMS
Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Mercury and the Estuarine Marsh Clam, Rangia Cuneata Gray. II. Uptake, Tissue Distribution, and Depuration,
W79-00979 5C

CLASSIFICATION
Preliminary Guide to Wetlands of Peninsular Florida; Major Associations and Communities Identified.
W79-00547 2I

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

CLASSIFICATION (BOTANICAL)
The Concept of Flooding of Botanical Objects and Classification of Flooding, (In Ukranian),
W79-00612 2I

CLAYS
Magnetic Relaxation Study of Water Mobility in Clay Minerals,
W79-00679 2G

NMR Investigation of Mobility of Water Sorbed by Clay Minerals,
W79-00910 2K

CLIMATOLOGY
Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

COAGULATION
Tests of Coagulants for the Reduction of Viruses, Turbidity, and Chemical Oxygen Demand,
W79-00868 5F

Virus Removal by Chemical Coagulation,
W79-00869 5F

COAL MINES
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

COASTAL AREA MANAGEMENT
Harbor and Waterfront Development Planning,
W79-00657 2L

COASTAL AREAS
State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

Cape Cod Water Quality Management Plan.
W79-00666 5G

COASTAL PLAINS
Water Resources of Northeast North Carolina,
W79-00631 7C

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

COASTAL PLANNING
State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

COASTAL ZONE MANAGEMENT
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

COASTAL ZONE MANAGEMENT ACT
State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

COASTS
Florida Coastal Zone Management: An Analysis,
W79-00602 6E

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

COLONIAL BIRDS
Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

COLOR
Light Responses of Daphnia Pulex,
W79-00566 5C

COLORADO RIVER
Colorado River Water Conservation District v. United States: an Increased Role for State Courts in the Adjudication of Federal Reserved Water Rights,
W79-00599 6E

COLORADO RIVER BASIN
Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

COLORIMETRY
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

COLUMBIA RIVER
Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

COMMON POOLS
Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

COMMUNITY DEVELOPMENT
Mandatory Dedication and Impact Fees: A Means of Sharing the Burden of Growth in the Melbourne-Tillman Drainage District,
W79-00601 6E

COMPETITION
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

COMPLEXATION
Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

COMPOSTS
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

COMPRESSIBILITY
Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

COMPUTER-AIDED DESIGN
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

COMPUTER MODELS
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

Computer Analysis of the Water Budget of the Proposed Oak Openings New Town, Lucas County, Ohio,
W79-00902 4C

COMPUTER PROGRAM
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

COMPUTER PROGRAMS
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

CONFERENCES
The Law of the Sea Conference and Its Aftermath,
W79-00616 6E

Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

CONSERVATION
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

CONSTRUCTION
Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

CONTAINMENT AREAS
Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

CONTINENTAL SHELF
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

CONTROL SYSTEMS
Treatment Control Apparatus for Water Systems,
W79-00820 5F

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT (CEPEX)
Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

CONTROLLED ROOT-ZONE WETTING
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

CONVEYANCE STRUCTURES
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

COODY CREEK (OK)
Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

COOLING TOWERS
Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

COOLING WATE
Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

COOLING WATER
Dissipation of Heat from Cooling Ponds,
W79-00702 5B

Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

COOLING WATER DISCHARGE
Optimal Control of Cooling Water Discharge from a Power Plant,
W79-00870 5G

COPEPODS
Acute Toxicity of Copper to a Copepod,
W79-00959 5C

Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

COPPER
Chemical Control of Hydrilla,
W79-00776 5G

A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

Acute Toxicity of Copper to a Copepod,
W79-00959 5C

Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

CORN (FIELD)
Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

CORPORATIONS
Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

COST ANALYSIS
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

COST-BENEFIT ANALYSIS
Cost-Benefit Analysis and Environmental Policy: A Comment (Smith),
W79-00596 6B

Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

COST COMPARISONS
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

COST SHARING
Mandatory Dedication and Impact Fees: A Means of Sharing the Burden of Growth in the Melbourne-Tillman Drainage District,
W79-00601 6E

COSTS
Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

COTTONWOOD RIVER (KAN)
Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

COXSACKIE B5
Antiviral Substances from California Marine Algae,
W79-00590 3C

CRANK-NICOLSON APPROXIMATION
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

CRAYFISH
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

CROP PRODUCTION
The Economic Realities of Drought,
W79-00582 6B

Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

CROPS
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

CRUDE OIL
Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

CULEX-PIPIENS
Studies on the Effectiveness of the Guppy Poecilia Reticulata in Controlling Culex Pipiens S.L.: II. Efficiency of Predation in Breeding Habitats, (In Japanese),
W79-00889 5G

Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

CULTIVATION
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

CURRENT VELOCITY
Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

CURRENTS (WATER)
Combined Housing and Standard for Water Flow Meters,
W79-00827 7B

CURRY COUNTY
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

CYANOPHYTA
Biological Control of Blue-Green Algae,
W79-00509 5A

CYCLING NUTRIENTS
Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Flows of Materials Between Poorly Flooded Tidal Marshes and Estuary,
W79-00987 5C

CZECHOSLOVAKIA
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

DAMS
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

DAPHNIA
Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

DAPHNIA PULEX
Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

Light Responses of Daphnia Pulex,
W79-00566 5C

DATA COLLECTIONS
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

On the Design of Hydrologic Data Networks,
W79-00636 7A

Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

DATA OUTLIERS
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

DATA PROCESSING
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

DATA STORAGE AND RETRIEVAL
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

DATING
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

DDE
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

DEADWOOD (SD)
Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

DEBT
The Economic Realities of Drought,
W79-00582 6B

DECISION MAKING
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES)
DOMES Upper Water Physical Oceanography, A Component of the DOMES Program,
W79-00885 5B

Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

DEEP SANDS
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

DEGRADATION (DECOMPOSITION)
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

DELAWARE
The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

DELAWARE BAY
The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

DEMERSAL FISH
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

DENSITY
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

DENVER (CO)
Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

DEPOSIT FEEDERS
A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

DEPTH
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

DEPURATION
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

Mercury and the Estuarine Marsh Clam, Rangia Cuneata Gray. II. Uptake, Tissue Distribution, and Depuration,
W79-00979 5C

DES MOINES RIVER BASIN (IA)
Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

DESALINATION
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

Thermal Power Station Combined with a Plant for Seawater Desalination,
W79-00846 3A

Preparation of Ion-Exchange Membranes with Extremely Low Areal Resistances.
W79-00904 3A

Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

DESALINATION APPARATUS
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

DESALINATION PROCESSES
University of California Saline Water Conversion Research.
W79-00875 3A

Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

DESALINIZATION PLANTS
Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

DESERTIFICATION
Non-Agricultural Land Use and Desertification,
W79-00806 4A

Desertification and Technological Adjustment in the Murray Mallee of South Australia,
W79-00807 3B

Desertification of Australia in Its Global Context,
W79-00819 6G

DESERTS
Desert Transformation in China.
W79-00798 4A

Desertification and Technological Adjustment in the Murray Mallee of South Australia,
W79-00807 3B

The Evolution of the Australian Deserts,
W79-00815 4A

Strategy for the Development and Management of Deserts.
W79-00818 4A

Desertification of Australia in Its Global Context,
W79-00819 6G

DESIGN CRITERIA
On the Design of Hydrologic Data Networks,
W79-00636 7A

DESNA WATERSHED (USSR)
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

DESORPTION
The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

DESTRATIFICATION
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

DESULFOVIBRIO DESULPHURICANS
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

DETRITUS
Detritus in the Lake Ecosystem,
W79-00552 5C

DIAGENESIS
Dolomitization in the Floridan Aquifer,
W79-00532 2F

DIAPOLE MOMENTS
Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

DIATOMIC MOLECULES
Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

DIATOMS
Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

DIBENZOTHIOPHENES
Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

DIEL MIGRATION
Light Responses of Daphnia Pulex,
W79-00566 5C

DIELDRIN
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

DIELECTRIC PROPERTIES
Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

DIQUAT
Chemical Control of Hydrilla,
W79-00776 5G

DISCHARGE (WATER)
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

DISCOUNT RATES
Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

Principles of Water Resources Planning (Phase II),
W79-00913 6B

DISINFECTION
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

DISPERSANTS
Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

DISPERSANTS

Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

DISPERSION
Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

DISSOLVED OXYGEN
Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

DISSOLVED SILICA
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

DISSOLVED SOLIDS
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

DISTRIBUTION
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

DISTRIBUTION PATTERNS
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

DITYLUM BRIGHTWELLII
Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

DIURNAL
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

DIURON
The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

DOLOMITIZATION
Dolomitization in the Floridan Aquifer,
W79-00532 2F

DOMESTIC WATER
Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

DOUGLAS COUNTY
Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

DOUGLAS CREEK
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

DRAINAGE
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

DRAINAGE AREA
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

DRAINAGE BASINS
Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

DRAINAGE PROGRAMS
What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

DRAINAGE SYSTEMS
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

Waterlogging and Salinisation in Irrigated Semi-Arid Regions of NSW,
W79-00812 3C

DRAINS
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

DRAWDOWN
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

DRAWDOWNS
Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

DREDGED MATERIAL
Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

DREDGED MATERIAL DISPOSAL
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound,

Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

DREDGING
Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

DROPS (STRUCTURES)
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

DROUGHT TOLERANCE
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

DROUGHTS
The Economic Realities of Drought,
W79-00582 6B

Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

DSMA
Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

DUNES
Desert Transformation in China.
W79-00798 4A

DUWAMISH WATERWAY
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

DYES
Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

EARTHQUAKES
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

EATON'S NECK
Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

ECOLOGICAL
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

ECOLOGICAL DISTRIBUTION
Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

ECOLOGY
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

Principles of Water Resources Planning (Phase II),
W79-00913 6B

ECONOMIC EFFICIENCY
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

ECONOMIC-ENVIRONMETAL TRADEOFFS
Environmental Quality and Gains from Trade,
W79-00589 5G

ECONOMIC FEASIBILITY
Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

ECONOMIC IMPACT
Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

ECONOMIC JUSTIFICATION
What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

ECONOMICS
The Economic Realities of Drought,
W79-00582 6B

Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

Environmental Quality and Gains from Trade,
W79-00589 5G

Cost-Benefit Analysis and Environmental Policy: A Comment (Smith),
W79-00596 6B

Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

ECONOMIES OF SCALE
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

ECOSYSTEM
Studies on a Saline Lake Ecosystem,
W79-00734 2H

ECOSYSTEMS
Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

Detritus in the Lake Ecosystem,
W79-00552 5C

ECOSYSTEMS

Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22s30, 1977,
W79-00723 5C

Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

EFFLUENT LIMITATIONS
Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

EFFLUENTS
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

EGGS
A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

ELECTRIC POWER PLANTS
Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

ELECTRIC POWERPLANTS
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

ELECTROLYSIS
Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

ELECTROSTATIC PRECIPITATION
Trace Element Study at a Primary Copper Smelter, Volume I,
W79-00879 5A

ELEOCHARIS
Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

ELLESMERE ISLAND
Former Ice Shelves in the Canadian High Arctic.
W79-00695 2C

ENERGY
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

ENERGY FLOW
A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

ENERGY TRANSFER
Detritus in the Lake Ecosystem,
W79-00552 5C

ENTRAINMENT
Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

ENVIROMENTAL EFFECTS
The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

ENVIRONMENT
Principles of Water Resources Planning (Phase II),
W79-00913 6B

ENVIRONMENTAL ANALYSIS
Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

ENVIRONMENTAL ASSESSMENTS
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

ENVIRONMENTAL ECONOMICS
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

Environmental Quality and Gains from Trade,
W79-00589 5G

Cost-Benefit Analysis and Environmental Policy: A Comment (Smith),
W79-00596 6B

Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

ENVIRONMENTAL EFFECTS
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

Oiled Seabird Rescue and Conservation,
W79-00740 5G

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Long-Term Effects of an Oil Spill on Fucus Macrofauna in a Small Baltic Bay,
W79-00745 5C

Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume I.
W79-00895 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume III.
W79-00897 6G

ENVIRONMENTAL IMPACT STATEMENT

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

ENVIRONMENTAL IMPACT STATEMENTS

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

ENVIRONMENTAL IMPACTS

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

ENVIRONMENTAL MANAGEMENT

Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

ENZYMES

Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

EPIPHYTES

Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

EQUATIONS

Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

EQUILIBRIUM

Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

EQUIPMENT

The United Kingdom Market for Air and Water Purification and Pollution Control Equipment,
W79-00790 5G

EROSION

Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

EROSION CONTROL

Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

ESTIMATING

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

ESTUARIES

Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

On Tidal Propagation in Shallow Rivers,
W79-00701 2L

Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

ESTUARINE ENVIRONMENT

Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

EUPLOTES VANNUS

Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

EURASIAN WATE MILFOIL

The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

EURASIAN WATER MILFOIL

Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

EURYHALINES

Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

EUTROPHICATION

Biological Control of Blue-Green Algae,
W79-00509 5A

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

EVALUATION

Federal Water Pollution Control Act Amendments of 1977 (Part 8, Washington, D.C.).
W79-00619 5G

The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

EVAPORATORS

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

EVERGLADES

Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

EXCHANGE VISITS
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

EXCLUSIVE ECONOMIC ZNE
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

EXCLUSIVE ECONOMIC ZONE
The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

EXCRETION
Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

EXHAUSTIBLE RESOURCES
Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

EXOTIC FISH
The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

EXPENDITURES
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

EXPLOITATION
'The Common Heritage of Mankind': Resource Management of the International Seabed,
W79-00608 6E

EXPLOSIVES
Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

EXTRACTIVE RESOURCES
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

FARM WASTES
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

FECAL PELLETS
A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

FEDERAL GOVERNMENT
Federal Water Pollution Control Act Amendments of 1977 (Part 5, Lemars, Iowa).
W79-00618 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 8, Washington, D.C.).
W79-00619 5G

FEDERAL RECLAMATION LAW
Reclamation Act of 1902: After 75 Years, 160 Acre Limitation Held Valid,
W79-00604 6E

FEDERAL RESERVATIONS
Colorado River Water Conservation District v. United States: an Increased Role for State Courts in the Adjudication of Federal Reserved Water Rights,
W79-00599 6E

FEDERAL-STATE WATER RIGHTS CONFLICTS
Colorado River Water Conservation District v. United States: an Increased Role for State Courts in the Adjudication of Federal Reserved Water Rights,
W79-00599 6E

FEDERAL WATER POLLUTION CONTROL ACT
Where Do Environmental Laws and Regulations Stand Today.,
W79-00607 5G

The Other Water Pollution (Nonpoint Source Pollution),
W79-00614 5B

Federal Water Pollution Control Act Amendments of 1977 (Part 2, Duluth and Alexandria, Minn.).
W79-00617 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 5, Lemars, Iowa).
W79-00618 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 8, Washington, D.C.).
W79-00619 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

FEEDLOTS
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

FEEDS
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

FENITROTHION
The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

FERTILIZERS
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

FILTER FEEDERS
Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

FINANCING
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

FINGER LAKES (NY)
The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

FINITE DIFFERENCE MODELS
Channel Routing by Finite Difference Method,
W79-00704 8B

FINITE ELEMENT ANALYSIS
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

FISH
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

FISH BEHAVIOR
Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

FISH CONSERVATION
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

Ocean Deserts and Ocean Oases,
W79-00817 5G

FISH CONTROL AGENTS
Effects of Antimycin on Stream Insects,
W79-00525 5C

The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

FISH DIETS
Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

FISH DISEASES
Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

FISH POPULATIONS
Diversity and Longitudinal Zonation in Fish Populations of Two Streams Entering a Metropolitan Area,
W79-00903 5C

FISH REPRODUCTION
Evaluation of Recirculating Systems for the Culture of Channel Catfish,
W79-00682 5G

Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

FISHKILL
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

FIXED-BED MODELS
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

FLAGFISH
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

FLASH FLOODS
A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

FLOCCULATION
Purification of Aqueous Waste from Initial Treatment of Wool - By Allowing Waste to Settle, Treating with Polyelectrolytes, and Reintroducing Separated Deposit before Final Separation Process.
W79-00727 5D

Propylammonium Halide Starch Derivatives - Used as Flocculants, and in Textile and Paper Industries.
W79-00729 5D

Virus Removal by Chemical Coagulation,
W79-00869 5F

FLOD CHARACTERISTICS
Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

FLOOD AREA
Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

FLOOD CONTROL
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

FLOOD DAMAGE
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

FLOOD DATA
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

FLOOD FORECASTING
A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

FLOOD PEAK
Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

FLOOD PLAIN INSURANCE
State and Federal Regulation of the Flood Plain,
W79-00600 6E

FLOOD PLAIN ZONING
State and Federal Regulation of the Flood Plain,
W79-00600 6E

FLOOD PLAINS
State and Federal Regulation of the Flood Plain,
W79-00600 6E

FLOOD PROFILES
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

FLOOD PROTECTION
Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

FLOODING
The Concept of Flooding of Botanical Objects and Classification of Flooding, (In Ukranian),
W79-00612 2I

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

FLOODS
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

FLORIDA
Aquatic Forage Processing in Florida,
W79-00531 4A

Dolomitization in the Floridan Aquifer,
W79-00532 2F

Some Aspects of Redox Trends in the Bottom Muds of a Mesotrophic Bayou Estuary,
W79-00533 5C

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Preliminary Guide to Wetlands of Peninsular Florida; Major Associations and Communities Identified.
W79-00547 2I

The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

Mandatory Dedication and Impact Fees: A Means of Sharing the Burden of Growth in the Melbourne-Tillman Drainage District,
W79-00601 6E

Florida Coastal Zone Management: An Analysis,
W79-00602 6E

Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

FLOW DURATION
Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

FLOW MEASUREMENT
Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

FLUORESCENCE
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

FLUORIDES
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

Removing Fluoride from Waste Water by Adding Calcium and Phosphate - and Precipitating Germs of Fluor:Apatite or Calcium Fluoride.
W79-00731 5D

FOLIATION
Origin of Foliation in Glaciers,
W79-00687 2C

FOOD HABITS
Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

Light Responses of Daphnia Pulex,
W79-00566 5C

FOOD POISONING
Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

FOOD WEBS
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

FORECASTING
The United Kingdom Market for Air and Water Purification and Pollution Control Equipment,
W79-00790 5G

Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

FOUNDATIONS
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

FRANCE
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

FRASER RIVER
On Tidal Propagation in Shallow Rivers,
W79-00701 2L

FREEZING
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

FRENCH SOMALILAND
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

FRESHWATER WATER SUPPLY DEVELOPMENT
The Iceberg Cometh.: International Law Relating to Antarctic Iceberg Exploitation,
W79-00603 6E

FUCUS VESICULOSUS
Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

FUELS
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

FULTON COUNTY (NY)
Hydrology, Fulton County, New York,
W79-00663 4A

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

GALERKIN METHOD
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

GALERKIN PROCEDURES
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

GALLIPOLIS LOCKS AND DAM (WV)
Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

GALVESTON BAY (TEX)
Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

GASTROPODS
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

GEOCHEMISTRY
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

GEOMORPHOLOGY
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

The Evolution of the Australian Deserts,
W79-00815 4A

GEORGETOWN HARBOR (SC)
Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

GEORGIA
Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

Wastewater Management Alternatives for the Shellfish Processing Industry,
W79-00995 5G

GEOTHERMAL STUDIES
Federal Reservation of Geothermal Resources,
W79-00613 4B

Geothermal Actuated Method of Producing Fresh Water and Electric Power,
W79-00826 3A

GERMANY
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

GLACIER D'ARGENTIERE' (SWITZERLAND)
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

GLACIER DE TSANFLEURON (SWITZERLAND)
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

GLACIERS
Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

Origin of Foliation in Glaciers,
W79-00687 2C

The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

GLACIOLOGY
Origin of Foliation in Glaciers,
W79-00687 2C

Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

GOVERNMENT POLICIES
Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

GRASS
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

GRATE INLETS
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

GRAYS HARBOR (WASH)
Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

GREAT AUSTRALIAN BIGHT
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

GREAT BAY SALT MARSH (NJ)
Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

GREAT LAKES
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

GRONDWATER SOURCES
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

GROUNDWATER
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 1. Hawaii.
W79-00641 7C

Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

Calculation of Daily Groundwater Levels in Swamps Using Meteorological Data,
W79-00715 4B

Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

GROUNDWATER AVAILABILITY
Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

GROUNDWATER MOVEMENT
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

Dolomitization in the Floridan Aquifer,
W79-00532 2F

GROUNDWATER RECHARGE
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

GROWTH RATES
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

GUAM
Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

GULF COASTAL PLAIN
Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

GULF OF CARPENTARIA (AUSTRALIA)
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

GULFS
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

GULLS
Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

HABITAT IMPROVEMENT
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

HABITATS
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

HABITATS

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

Habitat Structure and Stream Fish Communities,
W79-00940 2I

HAIKEY CREEK (OK)

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

HARBORS

Harbor and Waterfront Development Planning,
W79-00657 2L

Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

HARDNESS (WATER)

Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

HARVESTING

Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

HAWAII

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 1. Hawaii.
W79-00641 7C

Annual Report 1976-1977.
W79-00883 9D

HEAT TRANSFER

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

HEATED WATER

Dissipation of Heat from Cooling Ponds,
W79-00702 5B

HEAVY METALS

Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

HERBICIDES

The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

Chemical Control of Hydrilla,
W79-00776 5G

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

HERPES SIMPLEX

Antiviral Substances from California Marine Algae,
W79-00590 3C

HIGH FLOW

Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

HIGH PRESSURE

Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

HISTORY

Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

HUMAN DISEASES

Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

HUMAN HEALTH

Experience in Hygienic Expertise of Industrial Construction Projects, (In Russian),
W79-00518 5G

HUNGARY

Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

HYDRA

A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

HYDRAULIC CONDUCTIVITY

Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

HYDRAULIC EFFICIENCY

Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

HYDRAULIC MODELS

Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

HYDRAULIC SYSTEMS

Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

HYDRAULICS

Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

HYDRILLA

Aquatic Forage Processing in Florida,
W79-00531 4A

HYDRILLA VERTICILLATA

Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

Chemical Control of Hydrilla,
W79-00776 5G

Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

HYDROBIA MINUTA

A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

HYDROBIOLOGICAL STUDIES

Data Toward the Understanding of the Hydróbiological Status of Dead Tributary of

the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

HYDROCARBONS
Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

HYDROCHEMISTRY
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

HYDROELECTRIC PLANTS
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

HYDROELECTRIC POWER
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

HYDROGEN ION CONCENTRATION
Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

HYDROGRAPH SIMULATION
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

HYDROGRAPHIC SURVEYS
U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

HYDROGRAPHS
A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

HYDROGRAPHY
U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

HYDROLOGIC BUDGET
Computer Analysis of the Water Budget of the Proposed Oak Openings New Town, Lucas County, Ohio,
W79-00902 4C

HYDROLOGIC CYCLE
Hydrology, Fulton County, New York,
W79-00663 4A

HYDROLOGIC DATA
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

On the Design of Hydrologic Data Networks,
W79-00636 7A

Water Resources Data for Hawaii and Other Pacific Arcas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 1. Hawaii.
W79-00641 7C

Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

HYDROLOGIC MODELS
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

HYDROLOGIC STRUCTURES
On the Design of Hydrologic Data Networks,
W79-00636 7A

HYDROLOGICAL STUDIES
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

HYDROLOGY
Hydrology, Fulton County, New York,
W79-00663 4A

Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

Annual Report 1976-1977.
W79-00883 9D

HYPERSALINE LAKES
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

HYPHOMYCETES
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

ICE
Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

ICE BREAKUP
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

ICEBERGS
The Iceberg Cometh.: International Law Relating to Antarctic Iceberg Exploitation,
W79-00603 6E

ICHTHYOLOGICAL STUDIES
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

ILLINOIS
Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

ILLUDAS
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

IMPINGEMENT
Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

IMPOUNDMENTS
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

INCOME
The Economic Realities of Drought,
W79-00582 6B

INCOME DISTRIBUTION
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

INDIA
Dissipation of Heat from Cooling Ponds,
W79-00702 5B

INDIAN RIVER ESTUARY (FL)
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

INDIANA
Habitat Structure and Stream Fish Communities,
W79-00940 2I

INDIRECT EFFECTS
Principles of Water Resources Planning (Phase II),
W79-00913 6B

INDUSTRIAL WASTES
Wastefree Technology, (In Russian),
W79-00517 5G

The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Purification of Aqueous Waste from Initial Treatment of Wool - By Allowing Waste to Settle, Treating with Polyelectrolytes, and Reintroducing Separated Deposit before Final Separation Process.
W79-00727 5D

Removing Fluoride from Waste Water by Adding Calcium and Phosphate - and Precipitating Germs of Fluor:Apatite or Calcium Fluoride.
W79-00731 5D

Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

INDUSTRIAL WATER
Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

INFLOW
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

INFORMATION
To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

INFORMATION DISSEMINATION
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

INFORMATION EXCHANGE
Access to Scientific Information Through Computerized Information Systems,
W79-00684 10A

Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

INFORMATION RETRIEVAL
Access to Scientific Information Through Computerized Information Systems,
W79-00684 10A

INJECTION
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

INJECTION WELLS
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

INLAND WATERWAYS
Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

INLETS (WATERWAYS)
Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

INSECT CONTROL
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

INSECTICIDES
The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

INSTRUMENTATION
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

INTEREST RATES
Principles of Water Resources Planning (Phase II),
W79-00913 6B

INTERNAL LOADING
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

INTERNAL REVENUE SERVICE
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

INTERNATIONAL TRADE
Environmental Quality and Gains from Trade,
W79-00589 5G

INTERTIDAL AREA
Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

INTERTIDAL AREAS
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

Comparison of Oiled and Unoiled Intertidal Communities in Chedabucto Bay, Nova Scotia,
W79-00742 5C

Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

INUSTRIAL WASTES
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

INVERTEBRATES
Effects of Antimycin on Stream Insects,
W79-00525 5C

Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

ION EXCHANGE
Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

IONS
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

IOSPODS
Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

IOWA
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

IOWA-CEDAR RIVER BASIN (IA)
Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

IRON
Iron-Algae Interactions as a Factor in Lake Erie Water Quality,
W79-00936 5C

In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-00990 5C

IRON AND STEEL INDUSTRY
Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

IRRIGATION
Sprinkler Irrigation System and Apparatus for Directing a Stream of Water into the Atmosphere,
W79-00829 3F

Rotary Sprinkler Arc Adjustment,
W79-00830 3F

Water Dispensing Apparatus,
W79-00834 3F

Irrigation Tower Drive,
W79-00835 3F

Irrigation Pipe Laying and Pick Up Vehicle,
W79-00836 3F

Irrigation Apparatus,
W79-00844 3F

Sprinkler Head Selectively Operable in a Part-Circle Mode or a Full Circle Mode,
W79-00845 3F

IRRIGATION DISTRICTS
Reclamation Act of 1902: After 75 Years, 160 Acre Limitation Held Valid,
W79-00604 6E

IRRIGATION EFFECTS
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

IRRIGATION EFFICIENCY
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

Water Dispensing Apparatus,
W79-00834 3F

Irrigation Tower Drive,
W79-00835 3F

Irrigation Pipe Laying and Pick Up Vehicle,
W79-00836 3F

Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

IRRIGATION PRACTICES
Management of Brackish Waters in Arid Land Agriculture: Modern Experiences with Ancient Problems,
W79-00810 3C

Water Dispensing Apparatus,
W79-00834 3F

IRRIGATION SYSTEMS
Water Dispensing Apparatus,
W79-00834 3F

IRRIGATION WATER
A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

IRRIGATION WATER USE
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

IRRIGATION WELLS
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

IRRIGTION PRACTICES
Irrigation Pipe Laying and Pick Up Vehicle,
W79-00836 3F

ISLANDS
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

ISOPODS
Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

ISOTHERMAL COMPRESSIBILITY
Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

ISRAEL
The Problem of Water,
W79-00795 3B

JAMES RIVER
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

JETTIES
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

JONES COUNTY (TEXAS)
Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

JORDAN RIVER (UT)
Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

JORDANELLA
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

JUDICIAL DECISIONS
Colorado River Water Conservation District v. United States: an Increased Role for State Courts in the Adjudication of Federal Reserved Water Rights,
W79-00599 6E

Reclamation Act of 1902: After 75 Years, 160 Acre Limitation Held Valid,
W79-00604 6E

Federal Reservation of Geothermal Resources,
W79-00613 4B

JUVENILE GROWTH STAGE
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

KANSAS
Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

KANSAS CITY AREA
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

KARAKUM CANAL
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

KENTUCKY
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

KOLYMA WATER BALANCE STATION (USSR)
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

KOREA
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

LABORATORY TESTS
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

LAGOONS
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

LAKE ERIE
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

Iron-Algae Interactions as a Factor in Lake Erie Water Quality,
W79-00936 5C

The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

LAKE FRANCIS CASE (SD)
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

LAKE HURON
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

LAKE HYDROLOGY
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

LAKE MICHIGAN
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

LAKE ONTARIO
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

LAKE PONTCHARTRAIN (LA)
The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

LAKE POWELL (AZ UT)
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

LAKE RESTORATION
Acid Lake Renovation,
W79-00576 5G

LAKE SANGCHRIS (IL)
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

LAKE SUPERIOR
Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

LAKE TAHOE
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

LAKE VENGORITIS
The Knowledge of the Plankton of Lakes of Greece: III. The Zooplankton of Lake Vengoritis. (In German),
W79-00808 5C

LAKE VIITNA LINAJARV (USSR)
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

LAKE WAIPORI
Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

LAKE WINGRA (WI)
Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

LAKES
Biological Control of Blue-Green Algae,
W79-00509 5A

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

Detritus in the Lake Ecosystem,
W79-00552 5C

Acid Lake Renovation,
W79-00576 5G

Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

LAMPREYS
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

LAMPRICIDE
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

LAND MANAGEMENT
Salinisation in the Southwest of Western Australia,
W79-00803 3C

Strategy for the Development and Management of Deserts.
W79-00818 4A

LAND TENURE
Reclamation Act of 1902: After 75 Years, 160 Acre Limitation Held Valid,
W79-00604 6E

Land Tenure and Desertification in Australia's Arid Lands,
W79-00811 6E

LAND USE
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

Traditional Land Use in Marginal Drylands,
W79-00797 4A

Desertification of Australia in Its Global Context,
W79-00819 6G

Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

LANDFILLS
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

LANDSAT
An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques.
W79-00711 7B

LARVAL GROWTH STAGE
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

LARVICIDES
Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

LASERS
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

LATERITES
Salinisation in the Southwest of Western Australia,
W79-00803 3C

LAW OF THE SEA
The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

'The Common Heritage of Mankind': Resource Management of the International Seabed,
W79-00608 6E

The Law of the Sea Conference and Its Aftermath,
W79-00616 6E

LEA COUNTY
Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

LEAD
The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

LEAD (SD)
Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

LEAVES
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

LEGAL ASPECTS
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

LEGISLATION
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

Where Do Environmental Laws and Regulations Stand Today.,
W79-00607 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 5, Lemars, Iowa).
W79-00618 5G

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Mississippi Wetlands Protection Practice and Procedure.
W79-00927 6E

Oil Pollution Control Mechanisms - Statutes and Regulations.
W79-00928 5G

LEMNA MINOR
Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

LEMONS
Nitrogen Fertilizer Management of a Lemon Orchard as Related to Nitrate-Pollution Potential of Ground Water,
W79-00899 5B

LIGHT
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

Light Responses of Daphnia Pulex,
W79-00566 5C

Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

LIMESTONES
Dolomitization in the Floridan Aquifer,
W79-00532 2F

Acid Lake Renovation,
W79-00576 5G

LIMITING FACTORS
Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

LIPIDS
A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

LIQUEFIED NATURAL GAS TERMINAL SITES
Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

LITHUANIA
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

LITTORAL
Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

LOCAL GOVERNMENTS
State and Federal Regulation of the Flood Plain,
W79-00600 6E

LOCKS
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

LOTIC ENVIRONMENT
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

LOUISIANA
An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

LOW FLOW
Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

LUMBERING
The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

LYGIA
Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

LYNX LAKE (AZ)
Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

MACROINVERTEBRATES
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

MACROPHYTES
Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

MACRORETICULAR RESINS
A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

MAGADAN OBLAST (USSR)
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

MAGNETIC RESONANCE
Magnetic Relaxation Study of Water Mobility in Clay Minerals,
W79-00679 2G

MANAGEMENT
Florida Coastal Zone Management: An Analysis,
W79-00602 6E

Harbor and Waterfront Development Planning,
W79-00657 2L

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

MANGANESE
Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

MANURE STORAGE
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

MAPS
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

MARGINAL PRODUCTIVITY
Traditional Land Use in Marginal Drylands,
W79-00797 4A

MARINAS
Harbor and Waterfront Development Planning,
W79-00657 2L

MARINE ALGAE
Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

MARINE BIOLOGY
Ocean Deserts and Ocean Oases,
W79-00817 5G

MARKETING
The United Kingdom Market for Air and Water Purification and Pollution Control Equipment,
W79-00790 5G

MARSH MANAGEMENT
Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

MARSH PLANTS
Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

MARSHES
Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

MASS TRANSFER
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

MATHEMATICAL MODELS
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

MATHEMATICAL STUDIES
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

MEAN DAILY DISCHARGE
Hydrology, Fulton County, New York,
W79-00663 4A

MEASUREMENT
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

Water Level Measurement Device,
W79-00822 4A

MECHANICAL CONTROL
Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

MECHANICAL PROPERTIES
An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

MELTON HILL RESERVOIR (TN)
Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

MEMBRANE PROCESSES
Preparation of Ion-Exchange Membranes with Extremely Low Areal Resistances.
W79-00904 3A

Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

MENIDIA
Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

MERCURY
Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

Mercury and the Estuarine Marsh Clam, Rangia Cuneata Gray. II. Uptake, Tissue Distribution, and Depuration,
W79-00979 5C

MERCURY RECOVERY
Method of the Removal of Metallic Mercury,
W79-00840 5D

MESOTROPHY
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

METALS
Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

METHODOLOGY
Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

METROPOLITAN LANDSCAPE PLANNING MODEL
Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

MEXICO
Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

MICHIGAN
Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

MICROBIOLOGY
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

MICROORGANISMS
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

MIKOLAJSKIE LAKE (POLAND)
Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

MINE ENGINEERING
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

MINERAL CYCLING
Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

MINING
Non-Agricultural Land Use and Desertification,
W79-00806 4A

User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

MINNESOTA
Federal Water Pollution Control Act Amendments of 1977 (Part 2, Duluth and Alexandria, Minn.).
W79-00617 5G

MINNOWS
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

MISSISSIPPI
Mississippi Wetlands Protection Practice and Procedure.
W79-00927 6E

MISSISSIPPI RIVER
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

MISSOURI RIVER
A River in Space and Time,
W79-00615 6E

MIXING
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

MIXING DEVICE
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

MODEL STUDIES
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

Availability of Atmospheric Water,
W79-00685 2B

Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

On Tidal Propagation in Shallow Rivers,
W79-00701 2L

Dissipation of Heat from Cooling Ponds,
W79-00702 5B

Channel Routing by Finite Difference Method,
W79-00704 8B

Calculation of Daily Groundwater Levels in Swamps Using Meteorological Data,
W79-00715 4B

MODEL STUDIES

Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

MOHAWK RIVER (NY)
Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

MOISTURE CONTENT
Availability of Atmospheric Water,
W79-00685 2B

MOLECULAR STRUCTURE
Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

MOLLUSCA
Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

MONITORING
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

MONONGEHELA RIVER
Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

MONTANA
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

A River in Space and Time,
W79-00615 6E

MONTOMORILLONITE
NMR Investigation of Mobility of Water Sorbed by Clay Minerals,
W79-00910 2K

MSMA
Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

MULLETS
A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

MULTIPLE PURPOSE RESERVOIRS
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

MUNITIONS
Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

MURRELLS INLET (SC)
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

NAIDIDS
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

NAPHTHALENES
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

NATIONAL ENVIRONMENTAL POLICY ACT
The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

NATURAL RESOURCES
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

'The Common Heritage of Mankind': Resource Management of the International Seabed,
W79-00608 6E

NAVIGATION
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

NAVIGATION CONDITIONS
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

NEANTHES
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

NEARSHORE PROCESSES
Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

NEBRASKA
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

NEGOTIATIONS
The Law of the Sea Conference and Its Aftermath,
W79-00616 6E

NERITA RETICULATA
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

NESTING
Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

NETWORK DESIGN
On the Design of Hydrologic Data Networks,
W79-00636 7A

NEVADA
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

NEW YORK BIGHT
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

A Study of the Sources, Transport, and Reactions of Suspended Particles in Waters of the New York Bight,
W79-00993 5B

NEW ZEALAND
Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

NEWFOUNDLAND
An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

NIAGARA RIVER
Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

NICHES
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

Habitat Structure and Stream Fish Communities,
W79-00940 2I

NITRATES
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

NITROCELLULOSE
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

NITROGEN
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

Nitrogen Fertilizer Management of a Lemon Orchard as Related to Nitrate-Pollution Potential of Ground Water,
W79-00899 5B

NITROGLYCERIN
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

NOMADS
Traditional Land Use in Marginal Drylands,
W79-00797 4A

NON-POINT POLLUTION SOURCES
Cape Cod Water Quality Management Plan.
W79-00666 5G

NON-STRUCTURAL ALTERNATIVES
Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

NONPOINT POLLUTION
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

NONPOINT POLLUTION SOURCES
Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

NONPOINT SOURCES
Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

NORTH CAROLINA
Water Resources of Northeast North Carolina,
W79-00631 7C

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

NORTH DAKOTA
Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

NORTHEASTERN IOWA BASIN (IA)
Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

NORTHERN MARIANA ISLANDS
Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

NOTRE DAME BAY (NEWFOUNDLAND)
An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

NUCLEAR MAGNETIC RESONANCE
NMR Investigation of Mobility of Water Sorbed by Clay Minerals,
W79-00910 2K

NUCLEATION
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

NUCLEATION TEMPERATURE
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

NUMERICAL ANALYSIS
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

NUTRIENT BUDGET
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

NUTRIENT REMOVAL
Environmental Effects of Mechanical Harvesting,
W79-00770 4A

NUTRIENT REQUIREMENTS
The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

NUTRIENTS
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

NYMPHON
Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

OCEAN WASTE DISPOSAL
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

OCEAN WASTE DISPOSAL

Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

OCEANOGRAPHY

Ocean Deserts and Ocean Oases,
W79-00817 5G

DOMES Upper Water Physical Oceanography, A Component of the DOMES Program,
W79-00885 5B

OCEANS

An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

OEDOGONIUM

Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

OFFSHORE DISPOSAL

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

OGDEN RIVER (UT)

Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

OHIO

Computer Analysis of the Water Budget of the Proposed Oak Openings New Town, Lucas County, Ohio,
W79-00902 4C

Diversity and Longitudinal Zonation in Fish Populations of Two Streams Entering a Metropolitan Area,
W79-00903 5C

OHIO RIVER

Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

OIL

Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

Tamano Oil Spill in Casco Bay: Environmental Effects and Cleanup Operations.
W79-00983 5G

OIL INDUSTRY

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

OIL POLLUTION

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

Oiled Seabird Rescue and Conservation,
W79-00740 5G

Comparison of Oiled and Unoiled Intertidal Communities in Chedabucto Bay, Nova Scotia,
W79-00742 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

Oil Pollution Control Mechanisms - Statutes and Regulations.
W79-00928 5G

The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

Tamano Oil Spill in Casco Bay: Environmental Effects and Cleanup Operations.
W79-00983 5G

OIL SPILLS

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Long-Term Effects of an Oil Spill on Fucus Macrofauna in a Small Baltic Bay,
W79-00745 5C

Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Oil Pollution Control Mechanisms - Statutes and Regulations.
W79-00928 5G

Crisis Science: Investigations in Response to the Argo Merchant Oil Spill,
W79-00929 5C

The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

Tamano Oil Spill in Casco Bay: Environmental Effects and Cleanup Operations.
W79-00983 5G

OILY WATER
Purification of Aqueous Waste from Initial Treatment of Wool - By Allowing Waste to Settle, Treating with Polyelectrolytes, and Reintroducing Separated Deposit before Final Separation Process.
W79-00727 5D

OKLAHOMA
Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

OLIGOCHAETES
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

OLIGOTROPHY
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

ON-SITE DATA COLLECTIONS
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

ON-SITE INVESTIGATIONS
A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

ON-SITE TESTS
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

ONTARIO
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

OPTIMIZATION
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

OREM (UT)
Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

ORGANIC MATTER
Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

ORGANIC WASTES
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

ORGANOPHOSPHORUS INSECTICIDES
The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

OUTER CONTIENTAL SHELF
Environmental Assessment of the Alaskan Continental Shelf. Volume I.
W79-00998 6G

OUTER CONTINENTAL SHELF
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

Oiled Seabird Rescue and Conservation,
W79-00740 5G

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

Comparison of Oiled and Unoiled Intertidal Communities in Chedabucto Bay, Nova Scotia,
W79-00742 5C

Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Long-Term Effects of an Oil Spill on Fucus Macrofauna in a Small Baltic Bay,
W79-00745 5C

Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume I.
W79-00895 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume II.
W79-00896 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume III.
W79-00897 6G

Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

OUTER CONTINENTAL SHELF

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

Environmental Assessment of the Alaskan Continental Shelf. Volume II.
W79-00999 6G

OXALIS-ACETOSELLA
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

OXIDATION-REDUCTION POTENTIAL
Some Aspects of Redox Trends in the Bottom Muds of a Mesotrophic Bayou Estuary,
W79-00533 5C

OXYGEN
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

OXYGEN-CARBON DIOXIDE BUDGET
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

OXYGEN PRODUCTIVITY (PLANTS)
Oxygen Productivity of Periphyton on Higher Aquatic Plants (In Russian),
W79-00529 2I

OXYGEN TRANSFER
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

OYSTERS
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

OZONE
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

PACIFIC NORTHWEST U.S.
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

PALEOCLIMATOLOGY
Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

PALEOHYDROLOGY
Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

PALEONTOLOGY
Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

PANAMA
Habitat Structure and Stream Fish Communities,
W79-00940 2I

PARTICULATES
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

PASTURE MANAGEMENT
The Organization and Efficient Use of Desert Pastures in the USSR,
W79-00802 3F

PASTURES
The Organization and Efficient Use of Desert Pastures in the USSR,
W79-00802 3F

PATENTS
Purification of Aqueous Waste from Initial Treatment of Wool - By Allowing Waste to Settle, Treating with Polyelectrolytes, and Reintroducing Separated Deposit before Final Separation Process.
W79-00727 5D

Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

Propylammonium Halide Starch Derivatives - Used as Flocculants, and in Textile and Paper Industries.
W79-00729 5D

Removing Fluoride from Waste Water by Adding Calcium and Phosphate - and Precipitating Germs of Fluor:Apatite or Calcium Fluoride.
W79-00731 5D

Treatment Control Apparatus for Water Systems,
W79-00820 5F

Sulfur Gas Removing and Solid Particle Filter for Well Water,
W79-00821 5F

Water Level Measurement Device,
W79-00822 4A

Softening Unit for Appliance,
W79-00823 5F

Acid Dispenser for Water Softener Unit,
W79-00824 5F

Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

Geothermal Actuated Method of Producing Fresh Water and Electric Power,
W79-00826 3A

Combined Housing and Standard for Water Flow Meters,
W79-00827 7B

Water Sample Collecting Device,
W79-00828 7B

Sprinkler Irrigation System and Apparatus for Directing a Stream of Water into the Atmosphere,
W79-00829 3F

Rotary Sprinkler Arc Adjustment,
W79-00830 3F

Waste Water Purification System,
W79-00831 5D

Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

Sewage Treatment Device,
W79-00833 5D

Water Dispensing Apparatus,
W79-00834 3F

Irrigation Tower Drive,
W79-00835 3F

Irrigation Pipe Laying and Pick Up Vehicle,
W79-00836 3F

Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

Preparation of Liquid Fuel and Nutrients from Municipal Waste Water,
W79-00838 5D

Activated Sludge Treatment of Wastewater,
W79-00839 5D

Method of the Removal of Metallic Mercury,
W79-00840 5D

Method and Apparatus for Ammonia-Nitrogen Removal by Vacuum Desorption,
W79-00841 5D

Aerator Sewage Tank,
W79-00842 5D

Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

Irrigation Apparatus,
W79-00844 3F

Sprinkler Head Selectively Operable in a Part-Circle Mode or a Full Circle Mode,
W79-00845 3F

Thermal Power Station Combined with a Plant for Seawater Desalination,
W79-00846 3A

Water Purification Method,
W79-00847 5D

Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

Water Purification Means and Method,
W79-00852 5F

Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

PATH OF POLLUTANTS
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

PATHOGENIC BACTERIA
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

PEAK DISCHARGE
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

PERIPHYTON
Oxygen Productivity of Periphyton on Higher Aquatic Plants (In Russian),
W79-00529 2I

Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

PERMAFROST
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

PERMEABILITY
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

PERMITS
To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

PERU
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

PESTICIDE KINETICS
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

PESTICIDE RESIDUES
Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

PESTICIDE TOXICITY
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

PESTICIDES
Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

PETROLEUM HYDROCARBONS
Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

PHENOLS
Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

PHOSPHATASES
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

PHOSPHATE FERTILIZERS
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

PHOSPHATES
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

PHOSPHO-GYPSUM
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

PHOSPHORUS
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

PHOTOASSIMILATES
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

PHOTOPERIODS
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

PHOTOSYNTHESIS
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

PHYCHOLOGICAL ASPECTS
The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

PHYTOPLANKTON
An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

PHYTOPLANKTON

Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

The Knowledge of the Plankton of Lakes of Greece: III. The Zooplankton of Lake Vengoritis. (In German),
W79-00808 5C

Phytoplankton of Alkaline Waters at Kanem (Chad): VII. The Structure of Populations, (In French),
W79-00884 5C

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

Iron-Algae Interactions as a Factor in Lake Erie Water Quality,
W79-00936 5C

The Effects of Arsenate and Arsenite on the Growth and Morphology of the Marine Unicellular Algae Tetraselmis Chui (Chlorophyta) and Hymenomonas Carterae (Chrysophyta),
W79-00960 5C

Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

PIERS

Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

PIGMENTS

Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

PISCICIDES

Effects of Antimycin on Stream Insects,
W79-00525 5C

PLANKTON

Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

PLANNING

The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

Harbor and Waterfront Development Planning,
W79-00657 2L

State of North Carolina Coastal Management Program and Draft Environmental Impact Statement.
W79-00658 6G

Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

Principles of Water Resources Planning (Phase II),
W79-00913 6B

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

PLANT GROWTH

An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

PLANT PATHOGENS

Biological Control of Aquatic Weeds with Plant Pathogens,
W79-00534 4A

PLANT PHYSIOLOGY

Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

Changes in the Character of Meadow Plant Communities Induced by the Overflow and Stagnation of Salt Water, (In Polish),
W79-00610 5B

The Concept of Flooding of Botanical Objects and Classification of Flooding, (In Ukranian),
W79-00612 2I

The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

PLANT POPULATIONS

Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Preliminary Guide to Wetlands of Peninsular Florida; Major Associations and Communities Identified.
W79-00547 2I

Preliminary Guide to Wetlands of Puerto Rico, Major Associations and Communities Identified.
W79-00758 2I

PLAYAS
The Evolution of the Australian Deserts,
W79-00815 4A

PLUMES
Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

POECILIA-RETICULATA
Studies on the Effectiveness of the Guppy Poecilia Reticulata in Controlling Culex Pipiens S.L.: II. Efficiency of Predation in Breeding Habitats, (In Japanese),
W79-00889 5G

Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

POLAND
Changes in the Character of Meadow Plant Communities Induced by the Overflow and Stagnation of Salt Water, (In Polish),
W79-00610 5B

Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

POLAROGRAPHIC ANALYSIS
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

POLICY
Cost-Benefit Analysis and Environmental Policy: A Comment (Smith),
W79-00596 6B

Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

POLITICAL ASPECTS
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

POLLUTANT IDENTIFICATION
Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: II. Incubation Time (In Spanish),
W79-00580 5A

Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

POLLUTANT TRAJECTORY MODELS
Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

POLLUTION ABATEMENT
To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

Environmental Quality and Gains from Trade,
W79-00589 5G

Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

The United Kingdom Market for Air and Water Purification and Pollution Control Equipment,
W79-00790 5G

The MESA Puget Sound Project, Seattle, Washington. FY76-Annual Report.
W79-00888 2L

POLLUTION TAXES (CHARGES)
To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

POLYCHAETES
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

POLYCHLORINATED BIPHENYLS
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

POLYSIPHONIA LANOSA
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

PONDS
Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Dissipation of Heat from Cooling Ponds,
W79-00702 5B

PORPHYRA UMBILICALIS
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

PORTUGUES RIVER
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

POTABLE WATER
Geothermal Actuated Method of Producing Fresh Water and Electric Power,
W79-00826 3A

POTENTIAL WATER SUPPLY
Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

POTOMAC RIVER
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

PRECIPITATION CYCLE
Hydrology, Fulton County, New York,
W79-00663 4A

PREDATION
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

PREMINING PLANNING
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

PRIMARY PRODUCTIVITY
The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

PROBABILITY
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

PRODUCTIVITY
Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

PRODUCTIVITY

Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

Seston and Sediment Formation in Five Lake District Lakes,
W79-00738 5C

Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

PROJECT BENEFITS
What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

PROJECT POST-EVALUATION
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

PROPERTY RIGHTS
Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

PROVO RIVER (UT)
Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

PROVO (UT)
Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

PRUDEHOE BAY (ALASKA)
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

PRYMNESIUM
Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

PRYOR CREEK (OK)
Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

PUBLIC HEALTH
Experience in Hygienic Expertise of Industrial Construction Projects, (In Russian),
W79-00518 5G

PUBLIC LANDS
Federal Reservation of Geothermal Resources,
W79-00613 4B

PUBLIC POLICY
Environmental Quality and Gains from Trade,
W79-00589 5G

PUBLIC UTILITIES
Mandatory Dedication and Impact Fees: A Means of Sharing the Burden of Growth in the Melbourne-Tillman Drainage District,
W79-00601 6E

PUERTO RICO
Preliminary Guide to Wetlands of Puerto Rico, Major Associations and Communities Identified
W79-00758 2I

Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

PUGET SOUND PROJECT (WASH)
The MESA Puget Sound Project, Seattle, Washington. FY76-Annual Report.
W79-00888 2L

PUGET SOUND (WASH)
Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

PULP AND PAPER INDUSTRY
Propylammonium Halide Starch Derivatives - Used as Flocculants, and in Textile and Paper Industries.
W79-00729 5D

PULP WASTES
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

PUMPS
A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

PYCNOGONID
Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

QUALITY CONTROL
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

RAIN
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

RAIN FORESTS
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

RAIN WATER
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

RAINBOW TROUT
Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

RAINFALL
Availability of Atmospheric Water,
W79-00685 2B

A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

RAINFALL-RUNOFF RELATIONSHIPS
A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

RAINWATER COLLECTION SYSTEMS
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

RALSTON CREEK WATERSHED (IOWA)
Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

RANGE MANAGEMENT
Desert Transformation in China.
W79-00798 4A

Desertification in the Pastoral Rangelands of the Gascoyne Basin, Western Australia,
W79-00814 3F

RATIONING (WATER)
Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

RAYLEIGH-RITZ METHOD
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

RECIRCULATING SYSTEMS
Evaluation of Recirculating Systems for the Culture of Channel Catfish,
W79-00682 5G

Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

RECLAMATION
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

RECOLONIZATION
Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

RECREATION
Non-Agricultural Land Use and Desertification,
W79-00806 4A

RECYCLING
Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

REDISTRIBUTION (PLANTS)
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

REDUCTION (CHEMICAL)
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

REFLECTANCE
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

REFRACTION (WATER WAVES)
Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

REGIONAL ANALYSIS
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

Principles of Water Resources Planning (Phase II),
W79-00913 6B

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

REGIONAL SEWERAGE SYSTEMS
Principles of Water Resources Planning (Phase II),
W79-00913 6B

REGRESSION ANALYSIS
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

REGULATION
Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

REHABILITATION
Oiled Seabird Rescue and Conservation,
W79-00740 5G

REMOTE SENSING
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques.
W79-00711 7B

RENEWABLE RESOURCES
A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

RENNIE ISLAND (WASH)
Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

REPRODUCTION
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

RESEARCH EQUIPMENT
A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

RESEARCH FACILITIES
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

RESERVATION DOCTRINE
Federal Reservation of Geothermal Resources,
W79-00613 4B

RESERVOIR OPERATION
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

RESERVOIR RELEASES
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

RESERVOIRS
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

Several Problems of the Rational Construction and Exploitation of Reservoirs and Canals as Examplified by the Uchinskoye Reservoir and the Moscow Canal, (In Russian),
W79-00655 5G

Chemical Control of Hydrilla,
W79-00776 5G

RESINS
A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

RESISTANCE
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

RESOURCE DEPLETION
Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6

The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

RESOURCES DEVELOPMENT
DOMES Upper Water Physical Oceanography, A Component of the DOMES Program,
W79-00885 5B

Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

The MESA Puget Sound Project, Seattle, Washington. FY76-Annual Report.
W79-00888 2L

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume II.
W79-00896 6G

Environmental Assessment of the Alaskan Continental Shelf: Program Work Statements Fiscal Year 1978, Volume III.
W79-00897 6G

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

RESPIRATION
Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

RETURN FLOW
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

REVERSE OSMOSIS
Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

REVIEWS
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

RHODESIA
Availability of Atmospheric Water,
W79-00685 2B

RHODOPHYTA
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

RHODPHYTA
Antiviral Substances from California Marine Algae,
W79-00590 3C

RHONE RIVER
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

RIO
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

RISKS
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

RIVER BASINS
Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

RIVER REGULATION
A River in Space and Time,
W79-00615 6E

RIVER VAH (CZECH)
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

RIVERS
A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

On Tidal Propagation in Shallow Rivers,
W79-00701 2L

Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

ROCK CANYON CREEK (UT)
Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

ROCKY MOUNTAIN ARSENAL (COLO)
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

ROOSEVELT COUNTY
Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

ROOTED AQUATIC PLANTS
Aquatic Forage Processing in Florida,
W79-00531 4A

Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

ROTATIONS
The Organization and Efficient Use of Desert Pastures in the USSR,
W79-00802 3F

ROUTING
Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

RUNOFF
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

RUPPIA MARITIMA
Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

SACANDAGA RIVER (NY)
Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

SACRAMENTO RIVER (CAL)
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

SALINE LAKES
Studies on a Saline Lake Ecosystem,
W79-00734 2H

SALINE WATER
Changes in the Character of Meadow Plant Communities Induced by the Overflow and Stagnation of Salt Water, (In Polish),
W79-00610 5B

Waterlogging and Salinisation in Irrigated Semi-Arid Regions of NSW,
W79-00812 3C

SALINE WATER CONVERSION
University of California Saline Water Conversion Research.
W79-00875 3A

SALINITY
Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

Changes in the Character of Meadow Plant Communities Induced by the Overflow and Stagnation of Salt Water, (In Polish),
W79-00610 5B

Waterlogging and Salinisation in Irrigated Semi-Arid Regions of NSW,
W79-00812 3C

A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

Phytoplankton of Alkaline Waters at Kanem (Chad): VII. The Structure of Populations, (In French),
W79-00884 5C

The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

SALINIZATION
Salinisation in the Southwest of Western Australia,
W79-00803 3C

SALMON
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

SALMONELLA
Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

SALMONELLOSIS
Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

SALT MARSHES
Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

SALT MINES
Changes in the Character of Meadow Plant Communities Induced by the Overflow and Stagnation of Salt Water, (In Polish),
W79-00610 5B

SALTS
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

SAMPLING
Water Sample Collecting Device,
W79-00828 7B

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

SAN DIEGO (CALIF)
Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

SAN FRANCISCO BAY ESTUARY
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

SAN JOAQUIN VALLEY (CALIF)
Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

SANDS
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

SCENEDESMUS
Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

SCHISTOSOMIASIS
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

SCOUR
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

SCREENS
Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

SEA ICE
An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

SEA URCHIN
A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

SEA WATER
Bacteriological Investigations of Sea Water along the Dutch Coast: 1971 and 1972, (In German),
W79-00737 5C

Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

SEAGRASS
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

SEASONAL
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

SEDIMENT CONTROL
Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

SEDIMENT TRANSPORT
Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

SEDIMENTATION
Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

SEDIMENTS
The Other Water Pollution (Nonpoint Source Pollution),
W79-00614 5B

Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

Seston and Sediment Formation in Five Lake District Lakes,
W79-00738 5C

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

SEISMOLOGY
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

SEPARATION TECHNIQUES
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

SESTON
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

Seston and Sediment Formation in Five Lake District Lakes,
W79-00738 5C

SEVENMILE CREEK WATERSHED (IL)
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

SEWAGE BACTERIA
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

SEWAGE EFFLUENTS
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

SEWAGE SLUDGE
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

SEWAGE TREATMENT
Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

Sewage Treatment Device,
W79-00833 5D

Preparation of Liquid Fuel and Nutrients from Municipal Waste Water,
W79-00838 5D

Aerator Sewage Tank,
W79-00842 5D

Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

SHELLFISH
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

SHELLFISH PROCESSING INDUSTRY
Wastewater Management Alternatives for the Shellfish Processing Industry,
W79-00995 5G

SHELTERBELTS
Desert Transformation in China.
W79-00798 4A

SHOALING
Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

SHOALS
The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

SHORE BIRDS
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

SHORE PROTECTION
Harbor and Waterfront Development Planning,
W79-00657 2L

SHORES
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

SHRIMP
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

SILAGE
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

SILICA
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

SILVER
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

SIMULATION ANALYSIS
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

SKUNK RIVER BASIN (IA)
Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

SNAKE RIVER
Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

SNOW
Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

SNOW COVER
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

SNOW STRUCTURE
Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

SOCIAL ASPECTS
Principles of Water Resources Planning (Phase II),
W79-00913 6B

SOCIAL VALUES
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

SOIL CONSERVATION SERVICE
The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

SOIL CONTAMINATION
A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

SOIL MOISTURE
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

Magnetic Relaxation Study of Water Mobility in Clay Minerals,
W79-00679 2G

SOIL RESPIRATION
Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

SOIL STABILITY
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

SOIL TREATMENT
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

SOIL WATER MOVEMENT
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

SOILS
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

SOILS (MINERAL)
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

SOLAR ENERGY
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

SOUNDING
U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

SOUTH DAKOTA
Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

SOUTHERN CALIFORNIA BIGHT
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

SOUTHERN IOWA RIVER BASIN (IA)
Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

SPATIAL DISTRIBUTION
Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

SPAWNING (ABALONE)
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

SPAWNING (ARTIFICIAL)
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

SPECIES COMPOSITION
A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

SPECIES DIVERSITY
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

Habitat Structure and Stream Fish Communities,
W79-00940 2I

Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

SPERMATOGENESIS
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

SPILLWAYS
The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

SPRINKLER IRRIGATION
Sprinkler Irrigation System and Apparatus for Directing a Stream of Water into the Atmosphere,
W79-00829 3F

Rotary Sprinkler Arc Adjustment,
W79-00830 3F

Sprinkler Head Selectively Operable in a Part-Circle Mode or a Full Circle Mode,
W79-00845 3F

ST. LAWRENCE RIVER
On Tidal Propagation in Shallow Rivers,
W79-00701 2L

Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

STANDING CROPS
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

STATIC BIOASSAY
Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

STATISTICAL METHODS
Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

STATISTICAL MODELS
An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

STEEL INDUSTRY
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

STILLWATER CREEK (OK)
Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

STORM
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

STORM DRAINS
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

STORM RUNOFF
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

STORM SURGE
An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

STORM WATER
Measures Against Storm Water Pollution, (In Swedish),
W79-00726 5G

STORMWATER MANAGEMENT
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

STRAIN MEASUREMENT
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

STRATIFICATION
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

STRATIGRAPHY
Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

STREAM BEDS
Habitat Structure and Stream Fish Communities,
W79-00940 2I

STREAM FLOW
Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

STREAMFLOW
Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

Habitat Structure and Stream Fish Communities,
W79-00940 2I

STREAMFLOW FORECASTING
Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

STREAMS
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

STRENGTH
An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

STRUCTURAL BEHAVIOR
Origin of Foliation in Glaciers,
W79-00687 2C

STUDIES
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

STURGEON
State of the Stock of Sturgeon Acipenser Baeri Brandt in Siberian Rivers and Measures to Increase Their Reproduction, (In Russian),
W79-00736 5G

SUBAQUEOUS DISPOSAL AREAS
Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

SUBLETHAL EFFECTS
Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

SUBMARINE CANYONS
Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

SUBMERGED PLANTS
The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

SUBSEA PERMAFROST
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

SUBSTRATES
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

SUBSURFACE IRRIGATION
Irrigation Apparatus,
W79-00844 3F

SUCCESSION
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

SULFATES
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

SULFUR
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

SULFURIC ACID
Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

SUPERCOOLED WATER
Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

SUPERCOOLING
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

SURFACE-GROUNDWATER RELATIONSHIPSM
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

SURFACE RUNOFF
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

SURFACE WATERS
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 1. Hawaii.
W79-00641 7C

Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

SURFACES
Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

SURVEYING INSTRUMENTS
U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

SURVEYS
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

SURVIVAL
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

SUSPENDED SOLIDS
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

A Study of the Sources, Transport, and Reactions of Suspended Particles in Waters of the New York Bight,
W79-00993 5B

SUSPENSION
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

SUSPENSION FEEDERS
Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

SUSQUEHANNA RIVER BASIN
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

SWAMP FORESTS
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

SWAMPS
Calculation of Daily Groundwater Levels in Swamps Using Meteorological Data,
W79-00715 4B

SWITZERLAND
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

SYSTEMS ANALYSIS
Proceedings of the First US/USSR Symposium on Comprehensive Analysis of the Environment.
W79-00654 6G

TAX DEDUCTIONS
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

TAXES
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

TEMPERATURE
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

TEMPERATURE DISTRIBUTION
The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

TEMPERATURE OF MAXIMUM DENSITY
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

TEMPERATURES
A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

TEMPORAL DISTRIBUTION
Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

TENNESSEE-TOMBIGBEE WATERWAY
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

TENSILE STRENGTH
Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

TERTIARY TREATMENT
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

TEXAS
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

TEXTILE WASTES
Purification of Aqueous Waste from Initial Treatment of Wool - By Allowing Waste to Settle, Treating with Polyelectrolytes, and Reintroducing Separated Deposit before Final Separation Process.
W79-00727 5D

Propylammonium Halide Starch Derivatives - Used as Flocculants, and in Textile and Paper Industries.
W79-00729 5D

TEXTILES
Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

THERMAL POLLUTION
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

THERMAL POWERPLANTS
A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

THERMAL STRESS
Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

THERMOCLINE
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

TIDAL EFFECTS
Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

TIDAL INLETS
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

TIDAL MARSHES
Flows of Materials Between Poorly Flooded Tidal Marshes and Estuary,
W79-00987 5C

TIDAL PROPAGATION
On Tidal Propagation in Shallow Rivers,
W79-00701 2L

TIDES
Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

On Tidal Propagation in Shallow Rivers,
W79-00701 2L

TILAPIA MOSSAMBICA
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

TILAPIA ZILLII
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

TILE DRAINAGE
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

TISSUE ANALYSIS
The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

Tamano Oil Spill in Casco Bay: Environmental Effects and Cleanup Operations.
W79-00983 5G

TNT
Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

TOMBIGBEE RIVER (MISS)
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

TORREY CANYON
Oiled Seabird Rescue and Conservation,
W79-00740 5G

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

TOXICITY
Effects of Antimycin on Stream Insects,
W79-00525 5C

Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

Chemical Control of Hydrilla,
W79-00776 5G

Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

Acute Toxicity of Copper to a Copepod,
W79-00959 5C

Individual and Combined Toxicity of Some Petroleum Aromatics to the Marine Amphipod Elasmopus Pectenicrus,
W79-00963 5C

Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

TOXICITY TESTING
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

TOXINS
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

TRACE ELEMENTS
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

TRACE METALS
Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

TRANSLOCATION
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

TRANSPORT
Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

TRANSPORTATION
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

TREATMENT FACILITIES
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

TRENTON (NJ)
The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

TRIPTON
Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

TROPHIC LEVEL
Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

TROPICAL REGIONS
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

TRUST TERRITORY OF THE PACIFIC ISLANDS
Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
W79-00640 7C

TSALA APOPKA LAKE
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

TUBERS
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

TURIEC RIVER (CZECH)
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

TWIN LAKES (OH)
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

UKRAINIAN-SSR
Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

ULTRAVIOLET RADIATION
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

UNCLOS III
The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

UNDERGROUND WASTE DISPOSAL
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

UNITED KINGDOM
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

The United Kingdom Market for Air and Water Purification and Pollution Control Equipment,
W79-00790 5G

UNITED NATIONS
'The Common Heritage of Mankind': Resource Management of the International Seabed,
W79-00608 6E

The Law of the Sea Conference and Its Aftermath,
W79-00616 6E

UNITED STATES
Federal Water Pollution Control Act Amendments of 1977 (Part 5, Lemars, Iowa).
W79-00618 5G

Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

UNSATURATED ZONE
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

UNSTEADY FLOW
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

URBAN DRAINAGE
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

URBAN RUNOFF
The Other Water Pollution (Nonpoint Source Pollution),
W79-00614 5B

Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

UREA
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

UREASE
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

USSR
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

The Organization and Efficient Use of Desert Pastures in the USSR,
W79-00802 3F

Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

UTAH
Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

UTAH LAKE (UT)
Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

VACCINIUM-MYRTILLUS
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

VALUES
A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

VEGETATION
Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

VEGETATION EFFECTS
Salinisation in the Southwest of Western Australia,
W79-00803 3C

VEGETATION ESTABLISHMENT
Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

VERTICAL PLUMES
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

VIRGIN ISLANDS
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

VIRICIDES
Antiviral Substances from California Marine Algae,
W79-00590 3C

VIRUSES
Antiviral Substances from California Marine Algae,
W79-00590 3C

Tests of Coagulants for the Reduction of Viruses, Turbidity, and Chemical Oxygen Demand,
W79-00868 5F

Virus Removal by Chemical Coagulation,
W79-00869 5F

VISTULA RIVER (USSR)
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

VISUAL RESOURCE ASSESSMENT
Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

VOLCANOES
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

VOTING
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

WADING BIRDS
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

WASHINGTON
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

WASTE DISPOSAL
Annual Report 1976-1977.
W79-00883 9D

WASTE DISPOSAL SITES
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

WASTE PICKLING LIQUOR
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

WASTE WATER (POLLUTION)
Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

WASTE WATER TREATMENT
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase I Study,
W79-00667 5D

A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

Waste Water Purification System,
W79-00831 5D

Sewage Treatment Device,
W79-00833 5D

Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

Preparation of Liquid Fuel and Nutrients from Municipal Waste Water,
W79-00838 5D

Activated Sludge Treatment of Wastewater,
W79-00839 5D

Method of the Removal of Metallic Mercury,
W79-00840 5D

Method and Apparatus for Ammonia-Nitrogen Removal by Vacuum Desorption,
W79-00841 5D

Aerator Sewage Tank,
W79-00842 5D

Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

Water Purification Method,
W79-00847 5D

Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

Wastewater Management Alternatives for the Shellfish Processing Industry,
W79-00995 5G

WASTE WATER TREATMENT FACILITIES
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase I Study,
W79-00667 5D

WASTEWATER DISPOSAL
University of California Saline Water Conversion Research.
W79-00875 3A

WATER ALLOCATION (POLICY)
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

WATER ANALYSIS
Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

WATER BALANCE
Computer Analysis of the Water Budget of the Proposed Oak Openings New Town, Lucas County, Ohio,
W79-00902 4C

WATER BIRDS
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

WATER CHEMISTRY
Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

WATER CIRCULATION
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

WATER CONSERVATION
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

WATER COSTS
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

WATER DEMAND
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

WATER DISTRIBUTION (APPLIED)
Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

WATER HARVESTING
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

WATER HYACINTH
Aquatic Forage Processing in Florida,
W79-00531 4A

An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

WATER LAW
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

WATER LETTUCE
Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

WATER LEVELS
Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

Calculation of Daily Groundwater Levels in Swamps Using Meteorological Data,
W79-00715 4B

Water Level Measurement Device,
W79-00822 4A

WATER MANAGEMENT
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

Annual Report 1976-1977.
W79-00883 9D

WATER MANAGEMENT (APPLIED)
Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

The Problem of Water,
W79-00795 3B

User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

WATER POLICY
The Problem of Water,
W79-00795 3B

A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

WATER POLLUTION
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

Several Problems of the Rational Construction and Exploitation of Reservoirs and Canals as Examplified by the Uchinskoye Reservoir and the Moscow Canal, (In Russian),
W79-00655 5G

Harbor and Waterfront Development Planning,
W79-00657 2L

Assessing the Social Impacts of Oil Spills. Proceedings of an Invitational Symposium.
W79-00661 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Annual Report 1976-1977.
W79-00883 9D

WATER POLLUTION CONTROL
Wastefree Technology, (In Russian),
W79-00517 5G

Experience in Hygienic Expertise of Industrial Construction Projects, (In Russian),
W79-00518 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 2, Duluth and Alexandria, Minn.).
W79-00617 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

Measures Against Storm Water Pollution, (In Swedish),
W79-00726 5G

Analysis of Economic Effects of Environmental Regulations on the Integrated Iron and Steel Industry. Volume I.
W79-00788 5G

WATER POLLUTION EFFECTS
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

Comparison of Oiled and Unoiled Intertidal Communities in Chedabucto Bay, Nova Scotia,
W79-00742 5C

Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

Long-Term Effects of an Oil Spill on Fucus Macrofauna in a Small Baltic Bay,
W79 00745 5C

Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

Crisis Science: Investigations in Response to the Argo Merchant Oil Spill,
W79-00929 5C

The AMOCO CADIZ Oil Spill. A Preliminary Scientific Report,
W79-00935 5B

Environmental Assessment of the Alaskan Continental Shelf. Volume I.
W79-00998 6G

WATER POLLUTION SOURCES
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

The Other Water Pollution (Nonpoint Source Pollution),
W79-00614 5B

Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

A Study of the Sources, Transport, and Reactions of Suspended Particles in Waters of the New York Bight,
W79-00993 5B

Environmental Assessment of the Alaskan Continental Shelf. Volume II.
W79-00999 6G

WATER POLLUTION TREATMENT
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

Acid Lake Renovation,
W79-00576 5G

Waste Water Purification System,
W79-00831 5D

Sewage Treatment Device,
W79-00833 5D

Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

Preparation of Liquid Fuel and Nutrients from Municipal Waste Water,
W79-00838 5D

Activated Sludge Treatment of Wastewater,
W79-00839 5D

Method and Apparatus for Ammonia-Nitrogen Removal by Vacuum Desorption,
W79-00841 5D

Aerator Sewage Tank,
W79-00842 5D

Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

WATER PURIFICATION
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process.
W79-00507 3A

Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

Waste Water Purification System,
W79-00831 5D

Thermal Power Station Combined with a Plant for Seawater Desalination,
W79-00846 3A

Water Purification Method,
W79-00847 5D

Water Purification Means and Method,
W79-00852 5F

Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

Preparation of Ion-Exchange Membranes with Extremely Low Areal Resistances.
W79-00904 3A

Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

WATER QUALITY
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 1. Hawaii.
W79-00641 7C

Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

Harbor and Waterfront Development Planning,
W79-00657 2L

Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

Water Purification Means and Method,
W79-00852 5F

Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

Iron-Algae Interactions as a Factor in Lake Erie Water Quality,
W79-00936 5C

Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

A Study of the Sources, Transport, and Reactions of Suspended Particles in Waters of the New York Bight,
W79-00993 5B

WATER QUALITY CONTROL

Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Treatment Control Apparatus for Water Systems,
W79-00820 5F

Softening Unit for Appliance,
W79-00823 5F

Method and Apparatus for Ammonia-Nitrogen Removal by Vacuum Desorption,
W79-00841 5D

The MESA Puget Sound Project, Seattle, Washington. FY76-Annual Report.
W79-00888 2L

WATER QUALITY MANAGEMENT

Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

WATER QUALITY MANAGEMENT (APPLIED)

Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

WATER QUALITY MANAGEMET (APPLIED)

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

WATER QUALITY STANDARDS

Wastefree Technology, (In Russian),
W79-00517 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 8, Washington, D.C.).
W79-00619 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Cape Cod Water Quality Management Plan.
W79-00666 5G

Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

WATER RESOURCE PLANNING

The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

WATER RESOURCES

Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

Water Resources of Northeast North Carolina,
W79-00631 7C

Hydrology, Fulton County, New York,
W79-00663 4A

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques.
W79-00711 7B

Annual Report 1976-1977.
W79-00883 9D

WATER RESOURCES DEVELOPMENT

Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

Iowa Water Quality Management Plan: Southern Iowa Basin.
W79-00650 5G

Iowa Water Quality Management Plan: Iowa-Cedar River Basin.
W79-00651 5G

Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

The Problem of Water,
W79-00795 3B

Strategy for the Development and Management of Deserts.
W79-00818 4A

WATER REUSE

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

WATER REUSE

Treatment of Dyeing Effluents - By Oxygenation, Electrolysis Flocculation, Separation and Filtration, to Yield a Solvent Suitable for Further Dyeing.
W79-00728 5D

A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

WATER RIGHTS

A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

WATER SAMPLING

Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: II. Incubation Time (In Spanish),
W79-00580 5A

Water Sample Collecting Device,
W79-00828 7B

WATER SHORTAGE

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

WATER SOFTENING

Softening Unit for Appliance,
W79-00823 5F

Acid Dispenser for Water Softener Unit,
W79-00824 5F

Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

WATER-SOLUBLE FRACTIONS

Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

WATER SOURCES

Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

Sulfur Gas Removing and Solid Particle Filter for Well Water,
W79-00821 5F

Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

WATER SUPPLY

Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

Hydrology, Fulton County, New York,
W79-00663 4A

Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

WATER SURFACE ELEVATIONS

Great Lakes Water Levels 1974. Daily and Monthly Average Water Surface Elevations.
W79-00706 7C

WATER TEMPERATURE

Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

WATER TREATMENT

Federal Water Pollution Control Act Amendments of 1977 (Part 2, Duluth and Alexandria, Minn.).
W79-00617 5G

Treatment Control Apparatus for Water Systems,
W79-00820 5F

Sulfur Gas Removing and Solid Particle Filter for Well Water,
W79-00821 5F

Softening Unit for Appliance,
W79-00823 5F

Acid Dispenser for Water Softener Unit,
W79-00824 5F

Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

Water Purification Means and Method,
W79-00852 5F

Tests of Coagulants for the Reduction of Viruses, Turbidity, and Chemical Oxygen Demand,
W79-00868 5F

Virus Removal by Chemical Coagulation,
W79-00869 5F

WATER USE

Utah Lake-Jordan River Hydrologic Basins Water Quality Management Study. Volume I.
W79-00660 5G

WATER UTILIZATION

Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

WATER WELLS

Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

Sulfur Gas Removing and Solid Particle Filter for Well Water,
W79-00821 5F

WATER YIELD

Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

WATERFOWL

An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

WATERFRONT DEVELOPMENT

Harbor and Waterfront Development Planning,
W79-00657 2L

WATERFRONT MANAGEMENT
Harbor and Waterfront Development Planning,
W79-00657 2L

WATERSHEDS (BASINS)
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

WAVE HEIGHTS
Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

WAVELENGTHS
Light Responses of Daphnia Pulex,
W79-00566 5C

WAVES (WATER)
An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

WEATHERING
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

WEIGHT
Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

WELFARE (ECONOMICS)
Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

Environmental Quality and Gains from Trade,
W79-00589 5G

WESTERN IOWA RIVER BASIN (IA)
Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

WETLANDS
Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

Preliminary Guide to Wetlands of Peninsular Florida; Major Associations and Communities Identified.
W79-00547 2I

Preliminary Guide to Wetlands of Puerto Rico, Major Associations and Communities Identified.
W79-00758 2I

Mississippi Wetlands Protection Practice and Procedure.
W79-00927 6E

WHITE AMUR
Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

WHITE CATFISH
Effects of Aeration in Earthen Ponds on Water Quality and Production of White Catfish,
W79-00973 5C

WIDLIFE
A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

WILD RIVER ACT
A River in Space and Time,
W79-00615 6E

WILDLIFE
Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

WILDLIFE HABITATS
Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

WINDS
Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

WITHDRAWAL
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

WOLF CREEK (OK)
Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

WORMS
The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

YARINA COCHA
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

YEMEN ARAB REPUBLIC
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

ZINC
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

ZONATION
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

ZONATION (FISH)
Diversity and Longitudinal Zonation in Fish Populations of Two Streams Entering a Metropolitan Area,
W79-00903 5C

ZONE OF AERATION
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

ZOOPLANKTON
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

ZOOPLANKTON

The Knowledge of the Plankton of Lakes of Greece: III. The Zooplankton of Lake Vengoritis. (In German),
W79-00808 5C

Zooplankton of the Region of Nosy-Be: V. Cladocera: Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W79-00809 5C

Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

AUTHOR INDEX

ABADAL TORRUELLA, R.
Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

ACZEL, J.
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

ADAMS, M. S.
Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

ADAMS, R. M.
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

AHERN, T. P.
Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

ALBERTSEN, E. H.
Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

ALEXANDER, H. C.
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

AMES, W. E.
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

AMOROS, C.
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

ANDERSON, J. W.
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

ANDERSON, R. V.
The Effect of Lead on Oxygen Uptake in the Crayfish, Orconectes Virilis (Hagen),
W79-00941 5C

ANDREWS, W. H.
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

ANGELL, C. A.
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

ARBAB, M.
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

ARISTOVA, V. V.
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

ARMALY, B. F.
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

AUSNESS, R. C.
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

AYKULU, G.
A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

BABAEV, A.
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

BACHMANN, R. W.
Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

BAEZA BENITO, E.
Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

BAGNALL, L. O.
Aquatic Forage Processing in Florida,
W79-00531 4A

Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

BAILEY, G. W.
Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

BAKER, E. T.
Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

BAKKEN, D. A.
Acid Dispenser for Water Softener Unit,
W79-00824 5F

BALON, J. E.
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

BANSCI, I.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

BARBER, J.
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

BARNARD, J. R.
Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

BARNES, I.
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

BARTLETT, E. A.
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

BARTON, K.
The Other Water Pollution (Nonpoint Source Pollution),
W79-00614 5B

BASTL, I.
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

BASTON, L. JR.
The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

BATES, A. L.
Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

BATTERTON, J. C.
Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

BAWDEN, C. A.
Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

BAYER, D. E.
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

BEAMISH, F. W. H.
Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

BECKER, L.
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

BEETEM, W. A.
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

BEGALA, A. J. JR.
Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

BEHRMAN, A. S.
Water Purification Means and Method,
W79-00852 5F

BEL'GESOV, N. V.
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

BELVILLE, J.
A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

BEN MORDECHAI, YOSEF
The Problem of Water,
W79-00795 3B

BENNETT, F. W.
Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

BERGLAND, E.
Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

BETZER, P. R.
A Study of the Sources, Transport, and Reactions of Suspended Particles in Waters of the New York Bight,
W79-00993 5B

BEWERS, J. M.
Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

BILELLO, M. A.
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

BINKLEY, C.
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase I Study,
W79-00667 5D

BISHOP, A. B.
Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

BLAIR, J. W.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

BLAYLOCK, J. W.
Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

BLUS, L. J.
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

BOKUNIEWICZ, H. J.
Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

BOMIRSKI, A.
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

BOONE, C. G.
Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

BORCHARDT, L. G.
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

BOTTINO, N. R.
The Effects of Arsenate and Arsenite on the Growth and Morphology of the Marine Unicellular Algae Tetraselmis Chui (Chlorophyta) and Hymenomonas Carterae (Chrysophyta),
W79-00960 5C

BOURGEOIS, S.
Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

BOURNE, A. S.
An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

BOWDEN, J. P.
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

BOWMAN, R. S.
Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

BOYD, J. A. JR.
Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

BOYET, W. E.
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

BRADLEY, F.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

BRADLEY, R. S.
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

BRANDT, A. B.
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

BRANNON, J. M.
Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

BRETT, C. E.
Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

BRICK, R. W.
Effects of Water Quality, Antibiotics, Phytoplankton and Food on Survival and Development of Larvae of Scylla Serrata (Crustacea:Portunidae),
W79-00891 5C

BRISOU, J.
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

BROUGHTON, J. D.
Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

BROUSSARD, M. C. JR.
Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

BROWN, D. A.
Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

BROWN, E. D.
The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

BRUCH, J. C. JR.
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

BUCK, A. D.
Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

BUHTS, R. E.
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

BURGI, P. H.
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

BURNS, K.
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

BURY, J. R.
Treatment Control Apparatus for Water Systems,
W79-00820 5F

BUZAS, M. A.
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

CADOTTE, J. E.
Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

CALKIN, P. E.
Ancestral Niagara River Drainage: Stratigraphic and Paleontologic Setting,
W79-00703 4A

CAMPBELL, K. L.
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

CARACCIOLO, J.
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

CARLSON, R. F.
Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

CARPENTER, S. R.
Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

CARSON, F. W.
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

CARSWELL, W. J. JR.
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

CARTER, C. C.
Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

CASSELMAN, T. W.
Aquatic Forage Processing in Florida,
W79-00531 4A

CASTANEYRA MEDINA, C.
Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

CHANEY, A. H.
Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in Texas,
W79-00753 5C

CHEE, R.
A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

CHEN MIROSLAV, K. Y.
Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

CHENG, R. T.
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

CHETALTDINOV, M. G.
Experience in Hygienic Expertise of Industrial Construction Projects, (In Russian),
W79-00518 5G

CHISHOLM, S. W.
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

CHO, C.
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

CHROST, R. J.
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

CHU, W-S.
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

CHUNG, H. C.
Harbor and Waterfront Development Planning,
W79-00657 2L

CLADY, M. D.
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

CLAR, M. L.
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

CLARK, M. J.
The Relationship Between Coastal-Zone Management and Off-Shore Economic Development,
W79-00593 6B

CLARK, R. B.
Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

Oiled Seabird Rescue and Conservation,
W79-00740 5G

CLARK, R. C. JR.
Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

CLAYTON, J. R.
A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

COBB, S. P.
Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

COHN, M. J.
Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

COIL, J. A.
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

COLE, R. A.
Entrainment at a Once-Through Cooling System on Western Lake Erie,
W79-00878 5C

COLEMAN, R. T.
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

COLLINS, C. A.
Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

COLLINS, R. V.
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

COMITA, G. W.
Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

CONDON, R. W.
Land Tenure and Desertification in Australia's Arid Lands,
W79-00811 6E

CONDRA, G. D.
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

CONNELL, D. W.
A Kerosene-Like Taint in the Sea Mullet Mugil Cephalus (Linneaus) II. Some Aspects of the Deposition and Metabolism of Hydrocarbons in Muscle Tissue,
W79-00980 5C

CONOMOS, T. J.
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

CONTI, V.
Method of the Removal of Metallic Mercury,
W79-00840 5D

COOKE, G. D.
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

COOLEY, J.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

COOPER, D. C.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

COOTE, D. R.
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

COREY, A. B.
Mandatory Dedication and Impact Fees: A Means of Sharing the Burden of Growth in the Melbourne-Tillman Drainage District,
W79-00601 6E

CORNACCHIS, J. W.
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

COUGHLIN, J.
A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

COURTOIS, D.
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

COUTURE, R.
Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

CRAIG, G. R.
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

CRANE, N. L.
Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

CRAWFORD, J. A.
Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

CRETNEY, W. J.
Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

CROLEY, T. E. II.
Physical and Economic Aspects Associated with Runoff from Urban Growth in the Ralston Creek Watersheds,
W79-00906 4C

CROMARTIE, E.
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

CROSS, D. G.
A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

CRUMPTON, W. G.
Some Aspects of Redox Trends in the Bottom Muds of a Mesotrophic Bayou Estuary,
W79-00533 5C

D'SOUZA, R. S.
Dissipation of Heat from Cooling Ponds,
W79-00702 5B

DABROWSKA, T.
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

DAGGETT, L. L.
Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

DALE, J.
Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

DANILOVA, M. A.
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

DARNELL, R. M.
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

DAVYDENKO, I. O.
The Concept of Flooding of Botanical Objects and Classification of Flooding, (In Ukranian),
W79-00612 2I

DEANE, T. N.
Waste Water Purification System,
W79-00831 5D

DEIG, E. F.
Antiviral Substances from California Marine Algae,
W79-00590 3C

DELLAROSSA, V.
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

DELLEUR, J. W.
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

DEMAREST, J. M. II.
The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

DENDRINOS, D. S.
Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

DENIKE, E. E.
Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

DENIS, F.
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

DENNY, A. F.
Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

DEROMANO, O.
Irrigation Apparatus,
W79-00844 3F

DEVAI , G.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

DEVAI, I.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

DEVITT, D.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

DI MAGGIO, G.
The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

DILLON, T. M.
Mercury and the Estuarine Marsh Clam, Rangia Cuneata Gray. II. Uptake, Tissue Distribution, and Depuration,
W79-00979 5C

Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

DINGMAN, R. J.
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

DISALVO, L. H.
Antiviral Substances from California Marine Algae,
W79-00590 3C

DISKIN, M. H.
A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

DIXON, K. E.
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

DOMKA, F.
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

DONAHUE, R. L.
Manual for Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities,
W79-00717 4D

DREWA, G.
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

DREWRY, W. A.
Tests of Coagulants for the Reduction of Viruses, Turbidity, and Chemical Oxygen Demand,
W79-00868 5F

Virus Removal by Chemical Coagulation,
W79-00869 5F

DROOP, M. R.
An Approach to Quantitative Nutrition of Phytoplankton,
W79-00556 5C

DUBEY, P. S.
Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

DUNCAN, M.
The Economic Realities of Drought,
W79-00582 6B

DUNCAN, M. A.
Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

EASLEY, J. F.
Aquatic Forage Processing in Florida,
W79-00531 4A

EASTY, D. B.
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

EDMONDSON, J. M.
Geothermal Actuated Method of Producing Fresh Water and Electric Power,
W79-00826 3A

EDWARDS, D. K.
Habitat Development Field Investigations, Miller Sands Marsh and Upland Habitat Development Site, Columbia River, Oregon; Appendix F: Postpropagation Assessment of Wildlife Resources on Dredged Material,
W79-00760 5E

EDWARDS, T.
Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

EDWARDS, T. H.
Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EHRESMANN, D. W.
Antiviral Substances from California Marine Algae,
W79-00590 3C

EICHENBERGER,
Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

EIDE, I.
Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

EISCHEN, M. A.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

EL-HAWAWI, A. S. N.
Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

ELLIOTT, D.
Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

ELLIS, H. V. III
Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

EMILIANI, F.
Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: II. Incubation Time (In Spanish),
W79-00580 5A

EMMETT, B. A.
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

ENGLAND, J.
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

ENGLISH, M. J.
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

EPPLEY, R. W.
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

ERDMANN, D. E.
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

EVANS, K.
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

EVANS, L. V.
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

EVRARD, G.
Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

FABOS, J. GY
Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

FAGIN, H.
An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

FAN, L. T.
Optimal Control of Cooling Water Discharge from a Power Plant,
W79-00870 5G

FARRELL, M. P.
Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

FARRINGTON, J.
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

FEAR, H. W.
Hydrology, Fulton County, New York,
W79-00663 4A

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

FEELY, R. A.
Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

FERGUSON, T. L.
Substitute Chemical Program. Initial Scientific Review of MSMA/DSMA,
W79-00982 5B

FERNS, P. N.
Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

FESTA, J. F.
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

FINAKOV, G. Z.
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

FISHER, A. C.
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

FLEMER, D. A.
Flows of Materials Between Poorly Flooded Tidal Marshes and Estuary,
W79-00987 5C

FLEMING, J. M.
A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

FLOYD, G.
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

FONDS, A. W.
Bacteriological Investigations of Sea Water along the Dutch Coast: 1971 and 1972, (In German),
W79-00737 5C

FORNO, I. W.
An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

FOX, C.
Florida Coastal Zone Management: An Analysis,
W79-00602 6E

FOX, P. M.
Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

FRANCO, J. J.
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

FRANTSEV, A. V.
Several Problems of the Rational Construction and Exploitation of Reservoirs and Canals as Examplified by the Uchinskoye Reservoir and the Moscow Canal, (In Russian),
W79-00655 5G

FRASER, J.
Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

FREEMAN, T. E.
Biological Control of Aquatic Weeds with Plant Pathogens,
W79-00534 4A

FREER, P.
Non-Agricultural Land Use and Desertification,
W79-00806 4A

FREIKIN, Z.
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

FRIEDMAN, L. C.
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

FRIEDMAN, M.
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

FRONTIER, S.
Zooplankton of the Region of Nosy-Be: V. Cladocera: Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W79-00809 5C

FUCHS, E.
Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

GALLAGHER, J. L.
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

GAMULIN, D.
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

GANGSTAD, E. O.
Chemical Control of Hydrilla,
W79-00776 5G

Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

GARRARD, L. A.
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

GASITH, A.
Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

GAUFIN, S. O.
Colorado River Water Conservation District v. United States: an Increased Role for State Courts in the Adjudication of Federal Reserved Water Rights,
W79-00599 6E

GAVIS, J.
Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

GEBHART, G. E.
Effects of Mechanical Mixing in Reservoirs on Seasonal and Annual Growth Rates of Fishes,
W79-00514 2H

GILFILLAN, E. S.
Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

GIOFFRE, A. J.
Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

GLAZE, R. S.
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

GLEESON, R. A.
Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

GLIKSHTEIN, M. D.
Experience in Hygienic Expertise of Industrial Construction Projects, (In Russian),
W79-00518 5G

GLIWICZ, Z. M.
Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

GOBER, D. E.
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

GOLDSBY, T. L.
Effect of Water Level Fluctuation and Herbicide on Eurasian Watermilfoil in Melton Hill Reservoir,
W79-00775 5C

GOODMAN, D. J.
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

GOODSELL, M. A.
Irrigation Pipe Laying and Pick Up Vehicle,
W79-00836 3F

GOPALA KRISHNAN, T. C.
Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

GORDON, C. C.
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

GORDON, M. S.
Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

GORDON, R. N. SR.
Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

GORMAN, M. L.
Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

GORMAN, O. T.
Habitat Structure and Stream Fish Communities,
W79-00940 2I

GRACE, J. B.
The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

GRANAT, M. A.
Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

GREEN, D. R.
Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

GREENWOOD, D. E.
Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

GREIG, R. A.
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

GROSS, R. L.
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

GROUT, E. C.
Softening Unit for Appliance,
W79-00823 5F

GUARINO, C. F.
Activated Sludge Treatment of Wastewater,
W79-00839 5D

GUBLER, H.
An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

GUNNISON, D.
Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

GURGANUS, E. A.
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

GUSTAFSON, T. D.
Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

HAAN, C. T.
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

HAGSTROM, B. E.
A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

HALES, L. Z.
Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

HALLEGRAEFF, G. M.
Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

HALLER, W. T.
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

HALPERN, D.
DOMES Upper Water Physical Oceanography, A Component of the DOMES Program,
W79-00885 5B

HALSEY, M.
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

HAMMOND, L. C.
Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

HAMPSON, G. R.
No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

HARDEN, W.
A Report on the Use of the Macroreticular Resin XAD-2 to Isolate Pesticides from the Cape Fear River,
W79-00901 5A

HARDIN, E. L. JR.
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

HARDY, R.
Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

HARGETT, C. M.
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

HARMAN, P. D.
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

HARRIS, L. E.
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

HARRIS, R. P.
Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

HARRISON, W. D.
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

HARRISON, W. G.
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

HARSHBARGER, C. E.
The Economic Realities of Drought,
W79-00582 6B

HARVEY, G. R.
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

HATA, K.
Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

HATCH, M. T.
Antiviral Substances from California Marine Algae,
W79-00590 3C

HATCHER, P. G.
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

HAUSER, W. J.
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

HAUTH, L. D.
Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

HAYASHI, M.
Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

HAYES, S. P.
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

HAYES, W. B.
Plankton Community Structure: Evaluation of Analytical Methods Using Model Communities,
W79-00783 5C

HEALY, M. L.
Trace Metal Baselines in the DOMES Study Area,
W79-00887 5B

HEINLE, D. R.
Flows of Materials Between Poorly Flooded Tidal Marshes and Estuary,
W79-00987 5C

HELLWIG, R. E.
Aquatic Forage Processing in Florida,
W79-00531 4A

HELTON, D. O.
Mammalian Toxicological Evaluation of Wastewaters Resulting from the Manufacture of Primers,
W79-00915 5C

HENDERSON, R. A.
Acid Dispenser for Water Softener Unit,
W79-00824 5F

HENDRIX, W. G.
Visual Land Use Compatibility as a Significant Contributor to Visual Resource Quality,
W79-00873 6B

HENRICSON, K. O.
Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

HENTGES, J. F. JR.
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

HERMAN, S. G.
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

HESSER, E.
Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

HESTAND, R. S.
Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

HESTAND, R. S. III
Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

HIAI, A.
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

HICKEY, E. W.
Dolomitization in the Floridan Aquifer,
W79-00532 2F

HILL, W. W.
The National Environmental Policy Act and Federal Water Resources Planning: Effects and Effectiveness in the Corps and SCS,
W79-00665 5G

HILSENHOFF, W. L.
Effects of Antimycin on Stream Insects,
W79-00525 5C

HJORT, A.
Traditional Land Use in Marginal Drylands,
W79-00797 4A

HO, C. L.
Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

HOGAN, P.
State and Federal Regulation of the Flood Plain,
W79-00600 6E

HOLCIK, J.
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

HOLDSWORTH, G.
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

HOLDWAY, P. A.
Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

HOLLMAN, K. W.
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

HOOKE, R. L.
Origin of Foliation in Glaciers,
W79-00687 2C

HORE, F. R.
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

HORIUCHI, S.
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

HORVATH, K.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

HOUSTON, B. J.
Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

HUANG, Y. H.
Channel Routing by Finite Difference Method,
W79-00704 8B

HUDLESTON, P. J.
Origin of Foliation in Glaciers,
W79-00687 2C

HUDSON, J.
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase I Study,
W79-00667 5D

HUDSON, J. D.
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

HUDSON, J. W.
Wastewater Management Alternatives for the Shellfish Processing Industry,
W79-00995 5G

HUFF, L.
Economic Impact of a Proposed Change in the Ammonia Effluent Standards, R77-6,
W79-00789 5G

HUGHES, B. D.
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

HUGHES, J. R.
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

HUNT, W. R.
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

HUNTER, R. D.
Changes in Carbon and Nitrogen Content During Decomposition of Three Macrophytes in Freshwater and Marine Environments,
W79-00571 5C

HWANG, C. L.
Optimal Control of Cooling Water Discharge from a Power Plant,
W79-00870 5G

IGUCHI, S.
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

ILTIS, A.
Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

Phytoplankton from Waters of Kanem (Chad): IX. The Application of Correspondence Factorial Analysis to Population Studies, (In French),
W79-00849 2H

Phytoplankton of Alkaline Waters at Kanem (Chad): VII. The Structure of Populations, (In French),
W79-00884 5C

IRWIN, W. P.
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

IWAI, Y.
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

JACOBSEN, T. R.
Ammonia-Nitrogen Excretion in Daphnia Pulex,
W79-00563 5C

JAMES, L. D.
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

JANNSON, M.
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

JENKINS, D.
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

JOHNSON, G. A.
A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

JOHNSTON, W. E.
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

JONES, J. R.
Nutrient Inputs and Algal Blooms in Iowa Lakes,
W79-00510 5C

JORDAN, P. R.
Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

JUGET, J.
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

KAMALDEEP, K.
The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

KAMPELMACHER, E. H.
Bacteriological Investigations of Sea Water along the Dutch Coast: 1971 and 1972, (In German),
W79-00737 5C

KANEMASU, E. T.
Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

KANNO, H.
Density Maxima in High-Pressure Supercooled Water and Liquid Silicon Dixoide,
W79-00864 1A

KAPUR, K.
The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

KAPUSTINSKAITE, T. K.
Alteration of Swamp Forests Under the Effect of Drainage (In Russian),
W79-00585 5C

KARR, J. R.
Habitat Structure and Stream Fish Communities,
W79-00940 2I

KAS'YANOV, V. P.
State of the Stock of Sturgeon Acipenser Baeri Brandt in Siberian Rivers and Measures to Increase Their Reproduction, (In Russian),
W79-00736 5G

KAWAMURA, T.
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

KAWARATANI, R. K.
Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

KEIZER, P. D.
Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

KEMPER, R. J.
Sulfur Gas Removing and Solid Particle Filter for Well Water,
W79-00821 5F

KENEZEVIC, B.
Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

KENNEDY, R. H.
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

KESTERSON, J. W.
Aquatic Forage Processing in Florida,
W79-00531 4A

KHALATBARI, F.
Market Imperfections and the Optimum Rate of Depletion of Natural Resources,
W79-00583 6C

KIHLSTROM, J. E.
Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

KIM, Y.
Technical Study on the Artificial Precocious Breeding of Abalone, Haliotis Discus Hannai Ino, (In Korean),
W79-00515 2L

KING, G. A.
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

KING, P. E.
Salinity and Temperature Tolerance by Nymphon Gracile (Leach) and Achelia Echinata (Hodge) (Pycnogonida),
W79-00968 5C

KIPP, J.
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

KIRKA, A.
Ichthyological Investigation of the Protected Habitat of the Danubian Salmon (L.) on the River Turiec)Czechoslovakia) and Suggestions for its Management, (In Slovak),
W79-00718 6B

KISELEVA, M. I.
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

KLEIN, G.
A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

KNIGHT, A. W.
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

KNUTSON, G. C.
Irrigation Tower Drive,
W79-00835 3F

KOCK, A. K.
Water Dispensing Apparatus,
W79-00834 3F

KOENIGS, J. P.
In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-00990 5C

KOH, R. C. Y.
Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

KONENKO, A. D.
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

KOPANEV, I. D.
Probability Estimate of Snow-Cover Depth Distribution,
W79-00705 2C

KOTILA, P. M.
Effects of Antimycin on Stream Insects,
W79-00525 5C

KOTZ, S.
'The Common Heritage of Mankind': Resource Management of the International Seabed,
W79-00608 6E

KRZYSZTOFOWICZ, R.
A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

KUMARAGURU, A. K.
Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

KURIHARA, T.
Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.:

KURIHARA, T.

III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

Studies on the Effectiveness of the Guppy Poecilia Reticulata in Controlling Culex Pipiens S.L.: II. Efficiency of Predation in Breeding Habitats, (In Japanese),
W79-00889 5G

KWEREL, E.
To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

LA GATTA, D.
Sewage Treatment Device,
W79-00833 5D

LACEWELL, R. D.
Establishing Crop Acreage Flexibility Restraints for Subregions of the Texas High Plains,
W79-00505 6D

LACKMANN, C.
Reclamation Act of 1902: After 75 Years, 160 Acre Limitation Held Valid,
W79-00604 6E

LACOURSIERE, E.
Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

LAFARGUE, C.
Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

LANDIN, M. C.
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

LANE, E. F.
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

LANG, J. L.
Preparation of Liquid Fuel and Nutrients from Municipal Waste Water,
W79-00838 5D

LAPERRIERE, J. D.
Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

LAUGHLIN, L. J.
NMR Investigation of Mobility of Water Sorbed by Clay Minerals,
W79-00910 2K

LEARNER, M. A.
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

LEBLOND, P. H.
On Tidal Propagation in Shallow Rivers,
W79-00701 2L

LEE, C. R.
Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

LEE, J. J.
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

LEE, M. T.
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

LEE, W. Y.
Chronic Sublethal Effects of the Water Soluble Fractions of No. 2 Fuel Oils on the Marine Isopod, Sphaeroma Quadridentatum,
W79-00966 5C

Individual and Combined Toxicity of Some Petroleum Aromatics to the Marine Amphipod Elasmopus Pectenicrus,
W79-00963 5C

LEGNER, E. F.
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

LEIGH-ABBOTT, M. R.
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

LEITCH, J. A.
Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

LEPPAKOSKI, E. J.
Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

LEPPER, S. P.
Diurnal Stratification of Deep Water Impoundments,
W79-00874 2H

LETEY, J.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

LETTENMAIER, D. P.
On the Design of Hydrologic Data Networks,
W79-00636 7A

LEVINTON, J. S.
A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

LEWIS, C. S.
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

LEWIS, R. R. III
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. II: Patterns of Plant Succession,
W79-00544 6G

LIEBERMAN, J. T.
Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

LIN, Y. S.
Ecological Studies of Fishponds in Chupei,
W79-00952 5C

LINDPERE, A.
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

LINDSKOV, K. L.
Water Resources of Northeast North Carolina,
W79-00631 7C

LINDSTROM, L. S.
Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

LITTLER, M. M.
Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

LOCHHEAD, G.
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

LOCKE, L. N.
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

LONNING, S.
A Toxicological Evaluation of a Plastic Oil Absorbant,
W79-00958 5C

LOPEZ, G. R.
A Model of Renewable Resources and Limitation of Deposit-Feeding Benthic Populations,
W79-00575 5C

LORRAIN, R. D.
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

LOUDERBOUGH, E.
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

LOYACANO, H. A.
Effects of Aeration in Earthen Ponds on Water Quality and Production of White Catfish,
W79-00973 5C

LU, J. C. S.
Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

LUELING, K. H.
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

LUMIS, G.
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

LUND, L. J.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

LUNDQUIST, T. R.
The Iceberg Cometh.: International Law Relating to Antarctic Iceberg Exploitation,
W79-00603 6E

LYSTROM, D. J.
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

LYZENGA, D. R.
Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

MABBUTT, J. A.
Desertification of Australia in Its Global Context,
W79-00819 6G

MACHEMEHL, J. L.
Numerical Flow Model for an Atlantic Coast Barrier Island Tidal Inlet,
W79-00932 2L

MACKIE, P. R.
Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

MALGI, U.
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

MALMQUIST, P. A.
Measures Against Storm Water Pollution, (In Swedish),
W79-00726 5G

MALO, B. A.
The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

MALONE, P. G.
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

MANBECK, D. M.
A Groundwater Recharge Model and Application to a Small Watershed,
W79-00508 2F

MANN, K. H.
Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

MANN, R. M.
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

MANSELL, R. S.
Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

MANUWAL, D. A.
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

MARCUSON, W. F. III.
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

MARKARIAN, R. K.
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

MARSDEN, J. R.
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

MARSH, F. J.
Second Row Molecular Orbital Calculations Minimal and Minimal +3d Basis Calculations on Second Row Diatomics,
W79-00681 1A

MARSHALL, J. S.
Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

MARTIN, D. B.
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

MARTIN, E. L.
Biological Control of Blue-Green Algae,
W79-00509 5A

MARTIN, P. J.
The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

MASOOD, A.
Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

MATHIS, D. B.
Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

MATTHEWS, M. C.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

MAYER, R. J.
Aquatic Weed Management by Benthic Semi-Barriers,
W79-00774 4A

MAYO, D. W.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

MCAVEY, M. B.
Computer Analysis of the Water Budget of the Proposed Oak Openings New Town, Lucas County, Ohio,
W79-00902 4C

MCBRIDE, K.
Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

MCCABE, S. L.
A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

MCCARLEY, R. W.
Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

MCCARTY, W. M.
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

MCCOMAS, M. R.
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

MCCRACKEN, M. D.
Productivity of Oedogonium in Lake Wingra, Wisconsin,
W79-00522 5C

MCGILLIVARY, P. A.
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

MCLEAN, M. W.
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

MEDVED, R. A.
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

MELSOM, S.
Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

MERCER, L. J.
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

MEREZHKO, A. I.
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

MEYER, L. P.
Sprinkler Head Selectively Operable in a Part-Circle Mode or a Full Circle Mode,
W79-00845 3F

MIDDAUGH, D. P.
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

MILLER, G. H.
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

MITCHELL, S. F.
Phytoplankton Productivity in Tomahawk Lagoon, Lake Waipori and Lake Mahinerangi,
W79-00799 5C

MOEGLICH, K.
Water Purification Method,
W79-00847 5D

MONTZ, G. N.
The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

MOORE, W. E. JR.
Water Level Measurement Device,
W79-00822 4A

MORAITOU-APOSTOLOPOULOU, M.
Acute Toxicity of Copper to a Copepod,
W79-00959 5C

MORGAN, W. D.
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

MORSCHEL, E.
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

MORSE, E. V.
Salmonella as Monitors of Fecal Pollution in the Aquatic Environment,
W79-00867 5A

Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

MOSHIRI, G. A.
Some Aspects of Redox Trends in the Bottom Muds of a Mesotrophic Bayou Estuary,
W79-00533 5C

MOSS, B.
Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

MOSS, M. E.
On the Design of Hydrologic Data Networks,
W79-00636 7A

MOTODA, S.
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

MOUL, E. T.
No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

MTUSIAK, K.
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

MUELLER, H.
The Knowledge of the Plankton of Lakes of Greece: III. The Zooplankton of Lake Vengoritis. (In German),
W79-00808 5C

MUELLER, K.
Ecological and Phytohistorical Investigations of Lowland Bog Plant Biotopes of Ombrotrophic Bog with Special Respect to Its Pools and Lakes in Northwestern Germany, (In German),
W79-00732 5C

MUESSIG, P. H.
Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant,
W79-00950 5G

MULCAHY, M. J.
Salinisation in the Southwest of Western Australia,
W79-00803 3C

MULLER, W. A.
Biological Interactions and the Realized Niche of Euplotes Vannus from the Salt Marsh Aufwuchs,
W79-00557 5C

MURRAY, S. N.
Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

MYHROM, E. P.
Salmonellosis in Man and Animals as an Environmental Health Problem,
W79-00865 5A

MYKLESTAD, S.
Exchange of Heavy Metals in Ascophyllum Nodosum (L.) Le Jol. In Situ by Means of Transplanting Experiments,
W79-00955 5C

NARAYANAN, A. S.
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

NASH, P.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

NASKE, C. M.
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

NEFF, J. M.
Mercury and the Estuarine Marsh Clam, Rangia Cuneata Gray. II. Uptake, Tissue Distribution, and Depuration,
W79-00979 5C

Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

NEIL, J.
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

NELSON, B. R.
Sprinkler Irrigation System and Apparatus for Directing a Stream of Water into the Atmosphere,
W79-00829 3F

NEUMANN, J.
Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

NEVINS, J.
Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

NEWBOLD, J. D.
The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

NICHOLSON, H. P.
Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

NICOL, J. A. C.
Individual and Combined Toxicity of Some Petroleum Aromatics to the Marine Amphipod Elasmopus Pectenicrus,
W79-00963 5C

NIKOLAEV, V. N.
The Organization and Efficient Use of Desert Pastures in the USSR,
W79-00802 3F

NISHIMURA, G.
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

NISKIN, S. J.
Combined Housing and Standard for Water Flow Meters,
W79-00827 7B

Water Sample Collecting Device,
W79-00828 7B

NOGUCHI, K.
Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

NOTINI, M.
Long-Term Effects of an Oil Spill on Fucus Macrofauna in a Small Baltic Bay,
W79-00745 5C

NOVIKOV, S. M.
Calculation of Daily Groundwater Levels in Swamps Using Meteorological Data,
W79-00715 4B

NOVOTNY, J. F.
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

O'HARA, S. C. M.
Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

OKABE, M.
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

OKAMOTO, K.
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

OLIINYK, H. P.
Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

OOBA, T.
Drought Injury and Irrigation Effect on the Growth and Yield of Warm Season Grasses Cultivated on Mineral Soil, (In Japanese),
W79-00516 3F

ORLOB, G. T.
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

OSTERKAMP, T. E.
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

OSWALT, N. R.
Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

OTT, F. S.
Acute and Sublethal Toxicity of Naphthalene and Three Methylated Derivatives to the Estuarine Copepod, Eurytemora Affinis,
W79-00975 5C

OWCZAREK, J.
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

OWENS, E. H.
Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

PAABO, U.
Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

PACE, C. E.
Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

PADGETT, D. E.
Leaf Decomposition in a Tropical Rainforest Stream,
W79-00785 5C

PADMANABHAN, G.
Statistical and Stochastic Analyses of Synthetically Generated Urban Storm Drainage Quantity and Quality Data,
W79-00521 6A

PAGE, D. S.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

PALAMARCHUK, I. K.
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

PALLARES, C.
Nitrogen Fertilizer Management of a Lemon Orchard as Related to Nitrate-Pollution Potential of Ground Water,
W79-00899 5B

PARK, D. E.
The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

PARKER, N. C.
Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

Evaluation of Recirculating Systems for the Culture of Channel Catfish,
W79-00682 5G

PARKIN, D. T.
Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

PARRA, O. O.
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

PARSONS, T. R.
Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

PASCIAK, W. J.
Transport Limited Nutrient Uptake Rates in Ditylum Brightwellii,
W79-00565 5C

PATTEN, B. G.
Observations of a Cold-Water Intertidal Community After 5 Years of a Low-Level, Persistent Oil Spill from the General M.C. Meigs,
W79-00746 5C

PAUTSCH, F.
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

PAVLOU, S. P.
A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

PAVLOV, A. V.
Wastefree Technology, (In Russian),
W79-00517 5G

PEARCE, D.
Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

PEARCE, J.
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

PEARSON, F.
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

PEEL, D. A.
The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

PELS, S.
Waterlogging and Salinisation in Irrigated Semi-Arid Regions of NSW,
W79-00812 3C

PENNINGTON, W.
Seston and Sediment Formation in Five Lake District Lakes,
W79-00738 5C

PEQUEGNAT, W. E.
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

PERRINE, R. L.
Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

PERRON, L. E.
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

PERRY, F. C. JR.
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

PETERS, C. F.
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

PETERSEN, R. J.
Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

PETERSON, D. H.
Numerical Simulation of Dissolved Silica in the San Francisco Bay,
W79-00635 2L

PETERSON, F. M.
The Exploitation of Extractive Resources: A Survey,
W79-00584 6B

PETIT, D.
Zooplankton of the Nosy-Be Region: VII. Spatial-Temporal Distribution of the Genus Lucifer (Decapodes Sergestidae) in the Province Neritique, (In French),
W79-00848 2L

PFENNINGER, H.
Thermal Power Station Combined with a Plant for Seawater Desalination,
W79-00846 3A

PICCININI, C.
Method of the Removal of Metallic Mercury,
W79-00840 5D

PINGRY, D. E.
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

PLATT, S.
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

PLUMLEY, F. G.
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

POHLAND, F. G.
Wastewater Management Alternatives for the Shellfish Processing Industry,
W79-00995 5G

POLCYN, F. C.
Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

POLISHCHUK, V. V.
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

POLLACK, A. M.
Crisis Science: Investigations in Response to the Argo Merchant Oil Spill,
W79-00929 5C

POMROY, A. J.
A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

PORTER, G.
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

POS, J.
Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

POTTER, L. D.
Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell,
W79-00782 5C

POWELL, T. M.
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

POWERS, W. L.
Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

PRATT, A. E.
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

PRESLEY, B. J.
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

PRICE, R. D.
Occurrence, Quality, and Availability of Ground Water in Jones County, Texas,
W79-00709 2F

PROPHET, C. W.
Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

QUINN, J. G.
Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

RAMAMOORTHI, K.
Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

RAMANI, R. V.
User's Manual for Premining Planning of Eastern Surface Coal Mining, Volume I: Executive Summary,
W79-00877 5G

RANDAZZO, A. F.
Dolomitization in the Floridan Aquifer,
W79-00532 2F

RANDLE, R. W.
Effects of Bromine Chloride on Several Unicellular Green Algal Species Under Laboratory Conditions,
W79-00882 5D

RANSOM, J. D.
Species Diversity and Relative Abundance of Benthic Macro-Invertebrates of Cedar Creek Basin, Kansas,
W79-00991 5A

REID, R. O.
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

REINBOLD, K. A.
A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

REQUEJO, A. G.
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

REYGROBELLET, J. L.
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

RHOADS, F. M.
Influence of Water and Fertilizer Management on Yield and Water-Input Efficiency of Corn,
W79-00530 5B

RICCI, P. F.
Environmental Quality Expenditure Patterns and Urban Location: Effects on Income Groups,
W79-00586 6G

RICH, L. A.
Where Do Environmental Laws and Regulations Stand Today.,
W79-00607 5G

RICH, P. H.
Detritus in the Lake Ecosystem,
W79-00552 5C

RICHARDOT, M.
Structure and Dynamics of the French Upper Rhone Ecosystems: II. Hydrological and Ecological Study of Some Backwaters: First Results (In French),
W79-00735 5C

RICHERSON, P. J.
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

RICHEY, D. L.
Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

RICHTER, K. O.
Colonial Nesting Sea and Wading Bird Use of Estuarine Islands in the Pacific Northwest,
W79-00750 5E

RIDGWAY, H. C.
Rotary Sprinkler Arc Adjustment,
W79-00830 3F

RINELLA, F. A.
A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

ROBERTS, M. H. JR.
Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

ROBINSON, A. C.
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

ROBISON, J. H.
Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

ROBISON, T. M.
Water Resources of Northeast North Carolina,
W79-00631 7C

ROESIJADI, G.
Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

ROGERS, L.
Distribution and Abundance of Benthic Macrofauna in the Sewage Sludge Disposal Area, New York Bight Apex, February 1975,
W79-00930 5B

Distribution and Abundance of Benthic Organisms in the New York-New Jersey Outer Continental Shelf,
W79-00931 5B

ROGERS, P. M.
Diversity and Longitudinal Zonation in Fish Populations of Two Streams Entering a Metropolitan Area,
W79-00903 5C

ROLAN, R. G.
The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

ROLFE, G. L.
A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

ROMER, T.
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

ROSEBOOM, D. P.
Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

ROSENTHAL, H.
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

ROSS, B.
The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

ROSS, D. S.
Method and Apparatus for Ammonia-Nitrogen Removal by Vacuum Desorption,
W79-00841 5D

ROSS, I. J.
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

ROSSI, S. S.
Petroleum Hydrocarbon Resistance in the Marine Worm Neanthes Arenaceodentata (Polychaeta: Annelida), Induced by Chronic Exposure to No. 2 Fuel Oil,
W79-00967 5C

ROSSO, W. A.
Acid Lake Renovation,
W79-00576 5G

ROTHROCK, P. E.
Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

ROUX, M.
Phytoplankton from Waters of Kanem (Chad): IX. The Application of Correspondence Factorial Analysis to Population Studies, (In French),
W79-00849 2H

RUBY, S. M.
The Effects of Depressed pH on Spermatogenesis in Flagfish Jordanella Floridae,
W79-00964 5C

RUTLEDGE, A. T.
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

RYABOV, A. K.
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

SADOV, A. L.
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

SANDERS, H. L.
Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

SANDERS, J. G.
Enrichment of Estuarine Phytoplankton by the Addition of Dissolved Manganese,
W79-00976 5C

SANFORD, G. R.
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

SARIKELLE, S.
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

SARMA, T. P.
Dissipation of Heat from Cooling Ponds,
W79-00702 5B

SASA, M.
Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

Studies on the Effectiveness of the Guppy Poecilia Reticulata in Controlling Culex Pipiens S.L.: II. Efficiency of Predation in Breeding Habitats, (In Japanese),
W79-00889 5G

SASIOREK, J.
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

SCHARF, W. C.
Colonial Birds Nesting on Man-Made and Natural Sites in the U.S. Great Lakes,
W79-00765 2H

SCHINZINGER, R.
An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

SCHINZNGER, R.
Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

SCHNEIDER, J. J. JR.
Magnetic Relaxation Study of Water Mobility in Clay Minerals,
W79-00679 2G

SCHREIBER, E. A.
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

SCHREIBER, R. W.
Colonial Bird Use and Plant Succession on Dredged Material Islands in Florida; Vol. I: Sea and Wading Bird Colonies,
W79-00543 6G

SCHULTZ, D. P.
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

SCHWITZGEBEL, K.
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

SCOTT, D. F.
A Selected Annotated Bibliography of Economic Values of Fish and Wildlife and Their Habitats,
W79-00912 6C

SCOTT, F.
Economic Impact of Flooding on Agricultural Production in Northeast Central North Dakota,
W79-00911 6B

SCOTT, K. M.
Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

SEABERGH, W. C.
Improvements for Murrells Inlet South Carolina,
W79-00546 8B

SEKI, N.
Process for the Liquid Phase Oxidation of Organic Substance-Containing Effluents,
W79-00853 5D

SELIM, H. M.
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

SELVALINGAM, S.
Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

SEMINA, N. S.
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

SENDLEIN, L. V. A.
Technical and Regulatory Status of the Placement of Sanitary Landfills in Iowa,
W79-00502 5E

SEPHTON, H. H.
A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

SEYMOUR, R. J.
Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

SHAFLAND, P. L.
The Continuing Problem of Non-Native Fishes in Florida,
W79-00591 5G

SHELTON, S. P.
Tests of Coagulants for the Reduction of Viruses, Turbidity, and Chemical Oxygen Demand,
W79-00868 5F

SHERMAN, J. D.
Sequestering of CA++ and MG++ in Aqueous Media Using Zeolite Mixtures,
W79-00851 5F

SHERWOOD, B. E.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume I),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume I),
W79-00917 5C

SHOEMAKER, W. J.
What Constitutes 'Benefits' for Urban Drainage Projects,
W79-00872 6B

SHOWS, L. J.
Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

SHULER, C. B.
Water Level Measurement Device,
W79-00822 4A

SHULL, S. C.
Methods to Effect Cost Reductions in Municipal Water Systems,
W79-00678 6C

SIDORENDO, V. M.
Soils as a Factor in the Formation of Water Chemical Composition and Benthic Communities in Small Rivers of the Desna Basin, (In Russian),
W79-00520 2K

SIEBERT, H.
Environmental Quality and Gains from Trade,
W79-00589 5G

SIGRIST, R. M.
Harvest Dates in Ancient Mesopotamia as Possible Indicators of Climatic Variations,
W79-00816 2B

SIJ, J. W.
Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

SILVER, R. M.
Federal Reservation of Geothermal Resources,
W79-00613 4B

SIMCO, B. A.
Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

Evaluation of Recirculating Systems for the Culture of Channel Catfish,
W79-00682 5G

SIMM, H.
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

SIMMONS, J. W.
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

SIMMS, C. E.
Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

SINGH, S. M.
Accumulation of Heavy Metals in Rainbow Trout Salmo Gairdneri (Richardson) Maintained on a Diet Containing Activated Sewage Sludge,
W79-00977 5C

SIZEMORE, S.
Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

SLAFKES, M. E.
A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

SLAUGHTER, C. W.
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

SLOSS, J. M.
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

SLUSSER, G. F.
Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington; Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliot Bay, Seattle, Washington,
W79-00759 5E

SMART, R. M.
Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

SMITH, D. D.
An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean,
W79-00549 5C

SMITH, F. W.
A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

SMITH, T. L.
The Evolution of the Australian Deserts,
W79-00815 4A

SMITH, V. K.
Cost-Benefit Analysis and Environmental Policy: A Comment (Smith),
W79-00596 6B

SMOOT, M. H.
Geothermal Actuated Method of Producing Fresh Water and Electric Power,
W79-00826 3A

SMYTH, C. S.
Report on FY 1977 Numerical Modeling in Puget Sound,
W79-00992 5B

SOMMERFELD, M. R.
Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

SORENSON, E.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

SOUCHEZ, R. A.
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

SOUTHWARD, A. J.
Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

SOUTHWARD, E. C.
Recolonization of Rocky Shores in Cornwall After Use of Toxic Dispersants to Clean Up the Torrey Canyon Spill,
W79-00741 5C

SPEEDY, R. J.
Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 degrees C,
W79-00866 1A

SPOON, D. M.
Survey, Ecology, and Systematics of the Upper Potomac Estuary Biota: Aufwuchs Microfauna, Phase II,
W79-00506 5C

SQUIRE, V. A.
An Investigation into the Use of Strain Rosettes for the Measurement of Propagating Cyclic Strains,
W79-00697 2C

STARAST, H.
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

STEARNS, S. C.
Light Responses of Daphnia Pulex,
W79-00566 5C

STEBBING, A. R. D.
A Sublethal Technique for Assessing the Effects of Contaminants Using Hydra Littoralis,
W79-00944 5C

STEGEMAN, J. J.
Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

STEUCK, M. J.
Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

STEWART, E.
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

STILWELL, J. M.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume 1),
W79-00917 5C

STOLZENBACH, K. D.
Crisis Science: Investigations in Response to the Argo Merchant Oil Spill,
W79-00929 5C

STORCH, T. A.
Iron-Algae Interactions as a Factor in Lake Erie Water Quality,
W79-00936 5C

STOTT, B.
A Note on the Effect of Lowered Temperatures on the Survival of Eggs and Fry of the Grass Carp Ctenopharyngodon Idella (Valenciennes),
W79-00986 5C

STOWE, R. L.
Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

STURGIS, T. C.
Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

SUEN, T. J.
Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

SUGDEN, D. E.
Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

SULLIVAN, M. J.
Structural Characteristics of a Diatom Community Epiphytic on Ruppia Maritima,
W79-00561 5C

SVENSSON, G.
Measures Against Storm Water Pollution, (In Swedish),
W79-00726 5G

SWANK, R. R. JR.
Predicting Pesticide Runoff from Agricultural Land: A Conceptual Model,
W79-00796 5B

SWANSON, E. R.
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

SYNOWIEC, J. A.
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

SZABO, A.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

TABORS, R.
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

TAGEL SEED, M.
Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

TAKAHASKI, K.
Distribution and Composition of the Suspended Particulate Matter in the Waters of the DOMES Region,
W79-00886 5B

TANAKA, H.
Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

TANIGUCHI, A.
Differences in Productivities Between the Great Australian Bight and the Gulf of Carpentaria, Australia, in Summer,
W79-00579 5C

TEAL, J. M.
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

THOMAS, M. L. H.
Comparison of Oiled and Unoiled Intertidal Communities in Chedabucto Bay, Nova Scotia,
W79-00742 5C

THOMPSON, C. M.
Trace Element Study at a Primary Copper Smelter, Volume 1,
W79-00879 5A

Trace Element Study at a Primary Copper Smelter, Volume 2, Report Appendix,
W79-00880 5A

THOMPSON, D. H.
An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

THOMPSON, D. W.
Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

THOMPSON, J. D.
Ocean Deserts and Ocean Oases,
W79-00817 5G

TISCHLER, E. J.
Acid Dispenser for Water Softener Unit,
W79-00824 5F

TITARENKO, G. V.
A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

TOOR, H. S.
The Effect of Fenitrothion on Reproduction of a Teleost Fish, Cyprinus Carpio Communis Linn: A Biochemical Study,
W79-00956 5C

TORRANCE, J. D.
Availability of Atmospheric Water,
W79-00685 2B

TOURANGEAU, P. C.
Fluoride Accumulation in the Terrestrial and Aquatic Components of the Douglas Creek Drainage of Western Montana,
W79-00504 5C

TRAMER, E. J.
Diversity and Longitudinal Zonation in Fish Populations of Two Streams Entering a Metropolitan Area,
W79-00903 5C

TRAWLE, M. J.
Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

TREDWELL, C. J.
Fluorescence Lifetimes of Chlorella Pyrenoidosa,
W79-00784 5C

TRENT, L. L.
Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

TRIVEDI, R. C.
Evaluation of Toxicity of Some Industrial Wastes to Fish by Bioassay,
W79-00978 5B

TROYANO LOBATON, F.
Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
W79-00801 3A

TSENG, J. T.
Optimal Control of Cooling Water Discharge from a Power Plant,
W79-00870 5G

TSYTSARIN, G. V.
Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

TURK, J. T.
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

TURNER, C. H. C.
Translocation of Photoassimilated 14C in the Red Alga Polysiphonia Lanosa,
W79-00569 5C

TWERSKY, M.
Management of Brackish Waters in Arid Land Agriculture: Modern Experiences with Ancient Problems,
W79-00810 3C

UGARTE, E.
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

Limnological Study of the Chica de San Pedro, La Posada and Lo Mendez Lagoons: II. Quantitative Aspects of Winter Plankton and Its Relation to Physical and Chemical Aspects of the Environment (In Spanish),
W79-00577 5C

URBACH, G.
Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

USRY, J. W.
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

VAILLANCOURT, G.
Relation Between Aquatic Plants and Gastropods (Mollusca, Gastropoda) in the Region of the Gentilly I Nuclear Center (Quebec) (In French),
W79-00794 5C

VAN BAALEN, C.
Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

VAN NOORLE JANSEN, L. M.
Bacteriological Investigations of Sea Water along the Dutch Coast: 1971 and 1972, (In German),
W79-00737 5C

VAN, T. K.
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

VAN VLEET, E. S.
Contribution of Chronic Petroleum Inputs to Narragansett Bay and Rhode Island Sound Sediments,
W79-00722 5A

VANDERMEULEN, J. H.
Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

VAUGHAN, T. M.
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

VEDROS, N. A.
Antiviral Substances from California Marine Algae,
W79-00590 3C

VERSPOOR, E.
Tolerance to Lead in the Freshwater Isopod Asellus Aquaticus,
W79-00962 5C

VIKTOROV, S. V.
A Experience in Deciphering Space Photographs and Television Images of the Ustyurt Plateau for Hydrological Purposes (In Russian),
W79-00609 7B

VINCENT, M. K.
Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

VOTINOV, N. P.
State of the Stock of Sturgeon Acipenser Baeri Brandt in Siberian Rivers and Measures to Increase Their Reproduction, (In Russian),
W79-00736 5G

WABERS, B. A.
Removal of Wood-Derived Toxics from Pulping and Bleaching Wastes,
W79-00905 5D

WAGNER, R. H.
Eleocharis Acicularis (L) R and S: The Autecology of an Acid Tolerant Sedge,
W79-00984 5C

WAIWOOD, K. G.
Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo Gairdneri) Richardson,
W79-00945 5C

WALKER, H. J.
Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

WALKER, K. F.
Studies on a Saline Lake Ecosystem,
W79-00734 2H

WALLER, D. W.
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

WALLER, R. M.
Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

WALTON, A.
Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

WANSTRATH, J. J.
An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

WARD, J. D.
A Flash Flood Aid - The Limited Area QPF,
W79-00994 2B

WARNER, J. S.
Toxicity and Sublethal Effects of No. 2 Fuel Oil on the Supralittoral Isopod Lygia Exotica,
W79-00938 5C

WATSON, R. A.
Aspects of the Ecology of Prymnesium Parvum (Haptophyta) and Water Chemistry in the Norfolk Broads, England,
W79-00965 5C

WEEKS, E. P.
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

WELLS, F. E.
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

WEN, C. J.
An Experimental Study of Flow and Oxygen Transfer in Circulation Induced by Air Bubble Plumes,
W79-00856 2E

WENZLOFF, D. R.
Metal Accumulation and Depuration by the American Oyster, Crassostrea Virginica,
W79-00970 5B

WERNER, D.
Preferential Elimination of Dieldrin by some Diatoms Compared to Chlamydomonas and Scenedesmus Species,
W79-00937 5B

WEST, R. H.
Polychlorinated Biphenyls, Chlorinated Pesticides and Trace Metals in Soils of the Everglades National Park and Adjacent Agricultural Areas,
W79-00934 5B

WETZEL, R. G.
Detritus in the Lake Ecosystem,
W79-00552 5C

The Production Biology of Eurasian Watermilfoil (Myriophyllum Spicatum L.): A Review,
W79-00768 5C

WHEELER, G. L.
A Simulation Model for Lead Movement in a Watershed,
W79-00954 5B

WHILLANS, I. M.
Surface Mass-Balance Variability Near 'Byrd' Station, Antarctica, and Its Importance to Ice Core Stratigraphy,
W79-00688 2C

WHINSTON, A. B.
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

WHIPPLE, W. JR.
Principles of Water Resources Planning (Phase II),
W79-00913 6B

WHITE, D. E.
Global Distribution of Carbon Dioxide Dischargers, and Major Zones of Seismicity,
W79-00637 2K

WHITE, L. M.
Access to Scientific Information Through Computerized Information Systems,
W79-00684 10A

WHITLOCK, C. H.
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

WHITTLE, K. J.
Preliminary Assessment of the Presence of Oil in the Ecosystem at Ekofisk after the Blowout, April 22-30, 1977,
W79-00723 5C

WILDER, H. B.
Water Resources of Northeast North Carolina,
W79-00631 7C

WILE, I.
Environmental Effects of Mechanical Harvesting,
W79-00770 4A

Production and Utilization of Aquatic Plant Compost,
W79-00772 5G

WILKE, N. W.
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

WILLIAMS, M.
Desertification and Technological Adjustment in the Murray Mallee of South Australia,
W79-00807 3B

WILLIAMS, O. B.
Desertification in the Pastoral Rangelands of the Gascoyne Basin, Western Australia,
W79-00814 3F

WILLIAMSON, F. B.
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

WILSON, H. L.
Aerator Sewage Tank,
W79-00842 5D

WINTERS, K.
Sensitivity of Three Microalgae to Crude Oils and Fuel Oils,
W79-00894 5C

WIRTH, B.
A River in Space and Time,
W79-00615 6E

WITTE, W. G.
Laboratory and Field Measurements of Upwelled Radiance and Reflectance Spectra of Suspended James River Sediments Near Hopewell, Virginia,
W79-00881 5B

WOLF, P. L.
Underground Biomass Dynamics and Substrate Selective Properties of Atlantic Coastal Salt Marsh Plants,
W79-00545 2I

WOLFF, R. M.
Economic Impact of Proposed Thermal Discharge Standard for Lake Sangchris,
W79-00792 5G

WONG, C. S.
Long-Term Fate of a Heavy Fuel Oil in a Spill-Contaminated B.C. Coastal Bay,
W79-00720 5C

WOOD, E. F.
On the Design of Hydrologic Data Networks,
W79-00636 7A

WOOD, W. W.
Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

WRIGHT, T. D.
Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

WU, F. H. Y.
Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

YARROW, G.
Cost-Benefit Analysis and Environmental Policy: A Comment (Elliott and Yarrow),
W79-00597 6B

YARULIN, G. R.
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

YEATS, P. A.
Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

YEH, W. W-G.
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

YORK, D. W.
Virus Removal by Chemical Coagulation,
W79-00869 5F

YOSHIMURA, K.
Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

YOUNG, D. K.
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

YOUNG, M. W.
Species Densities of Macrobenthos Associated with Seagrass: A Field Experimental Study of Predation,
W79-00564 5C

YURCHENKO, V. V.
Oxygen Productivity of Periphyton on Higher Aquatic Plants (In Russian),
W79-00529 2I

ZYVOLOSKI, G.
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). DEPT. OF BIOCHEMISTRY.
Cadmium Accumulation by the Marine Red Alga Porphyra Umbilicalis,
W79-00578 5C

ABERDEEN UNIV. (SCOTLAND). DEPT. OF GEOGRAPHY.
Glacial Erosion by the Laurentide Ice Sheet,
W79-00694 2C

ABERDEEN UNIV. (SCOTLAND). DEPT. OF POLITICAL ECONOMY.
Cost-Benefit Analysis and Environmental Policy: A Reply to Elliott and Yarrow and to Smith,
W79-00598 6B

ABERDEEN UNIV. (SCOTLAND). DEPT. OF ZOOLOGY.
Lack of Effect of Ingested Forties Field Crude Oil on Avian Growth,
W79-00957 5C

ABO AKADEMI, TURKO (FINLAND). INST. OF BIOLOGY; AND TURKU UNIV. (FINLAND).
Recovery of Benthic Macrofauna from Chronic Pollution in the Sea Area off a Refinery Plant, Southwest Finland,
W79-00747 5C

ACAD. GIOENIA SCI. NAT., CATANIA, ITALY.
The Daly Poisoning of Modern Man (In Italian),
W79-00519 5C

ACADEMIA SINICA, TAIPEI (TAIWAN). DEPT. OF DESERT RESEARCH.
Desert Transformation in China.
W79-00798 4A

ADAM MICKIEWICZ UNIV., POZNAN (POLAND). INST. OF CHEMISTRY.
Effect of the Concentration of Nitrogen Compounds on Microbial Reduction of Sulphates,
W79-00572 5C

AHLSTROM (A.) OSAKEYHTIO, HELSINKI (FINLAND).
Process for Recovering Chemicals from the Waste Liqours of Sulfate Cellulose Digestion and the Waste Waters of Bleaching,
W79-00837 5D

AKADEMIYA NAUK ESTONSKOI SSR, TARTU. INST. OF ZOOLOGY AND BOTANY.
The Chemical Composition and Hydrochemical Regime of the Water in Lake Viitna Linajarv (In Estonian),
W79-00662 5C

AKADEMIYA NAUK LATVIISKOI SSR, RIGA. INST. OF BIOLOGY.
A Computer Model of the Population of Chironomids (In Russian),
W79-00659 5B

AKADEMIYA NAUK SSSR, PUSHCHINO. INST. OF BIOLOGICAL PHYSICS.
Dependence of Oxygen Evolution and Uptake by Chlorella Upon the Nature of Light Field Distribution in the Suspension,
W79-00553 5C

AKADEMIYA NAUK URSR, KIEV. CENTRAL REPUBLICAN BOTANICAL GARDEN.
The Concept of Flooding of Botanical Objects and Classification of Flooding, (In Ukranian),
W79-00612 2I

AKADEMIYA NAUK URSR, KIEV. INST. HIDROBIOLOGII.
Oxygen Productivity of Periphyton on Higher Aquatic Plants (In Russian),
W79-00529 2I

Effect of Macrophytes on Some Hydrochemical Indices of Shallow Areas of the Kremenchug Reservoir (In Russian),
W79-00606 5A

AKRON UNIV., OH. DEPT. OF CIVIL ENGINEERING.
Development of Computer Program for Linearized Subhydrographs Method for Urban Runoff Determination,
W79-00526 2A

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
The Politics of Hydroelectric Power in Alaska: Rampart and Devil Canyon--A Case Study,
W79-00512 6E

Development of an Operational Northern Aquatic Ecosystem Model,
W79-00513 2H

ALASKA UNIV., FAIRBANKS. GEOPHYSICAL INST.
Heat and Mass Transport Processes in Subsea Permafrost I. An Analysis of Molecular Diffusion and its Consequences,
W79-00700 2C

ALBERTA UNIV., EDMONTON. DEPT. OF GEOGRAPHY.
Former Ice Shelves in the Canadian High Arctic,
W79-00695 2C

ALL-UNION HYDROBIOLOGICAL SOCIETY, MOSCOW (USSR).
Several Problems of the Rational Construction and Exploitation of Reservoirs and Canals as Examplified by the Uchinskoye Reservoir and the Moscow Canal, (In Russian),
W79-00655 5G

AMERICAN CYANAMID CO., STAMFORD, CT. (ASSIGNEE).
Corrosion and Scale Inhibitors for Industrial Recirculating Cooling Water Systems,
W79-00832 3E

AMERICAN UNIV., WASHINGTON, DC. DEPT. OF CHEMISTRY.
Colorimetric Analysis of Ammonia in Water,
W79-00503 5A

AMSTERDAM UNIV. (NETHERLANDS). LIMNOLOGICAL LAB.
Pigment Diversity in Freshwater Phytoplankton. II. Summer-Succession in Three Dutch Lakes with Different Trophic Characteristics,
W79-00595 5C

ANKARA UNIV. (TURKEY). DEPT. OF SYSTEMATIC BOTANY.
A Quantitative Study of the Phytoplankton of the River Avon, Bristol,
W79-00568 5C

ARGONNE NATIONAL LABS, IL. RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIV.
Field Verification of Cadmium Toxicity to Laboratory Daphnia Populations,
W79-00942 5C

ARIZONA STATE UNIV., DEPT. OF BOTANY AND MICROBIOLOGY.
Nutrient Limitation of Phytoplankton in a Central Arizona Reservoir,
W79-00562 5C

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
A Moisture-Accounting Watershed Model for Single-Storm Events Based on Time-Area Concept,
W79-00813 2A

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Access to Scientific Information Through Computerized Information Systems,
W79-00684 10A

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
The Submerged Vegetation of Lake Pontchartrain, Louisiana,
W79-00988 2L

ARMY ENGINEER DISTRICT, SACRAMENTO, CA.
Flood Plain Information: Ogden River, Ogden, Utah.
W79-00669 4A

Flood Plain Information: Box Elder Creek, Brigham City, Utah.
W79-00670 4A

Flood Plain Information: Provo River and Rock Canyon Creek, Provo-Orem, Utah.
W79-00673 4A

ARMY ENGINEER DISTRICT, TULSA, OK.
Flood Plain Information: Wolf Creek, Lawton, Oklahoma.
W79-00671 4A

Flood Plain Information: Chikaskia River, Blackwell, Oklahoma.
W79-00672 4A

Flood Plain Information: Coody Creek, Muskogee, Oklahoma.
W79-00674 4A

Flood Plain Information: Haikey Creek, Tulsa County, Oklahoma.
W79-00675 4A

Flood Plain Information: Pryor Creek and Salt Branch, Pryor Creek, Oklahoma.
W79-00676 4A

Flood Plain Information: Stillwater Creek and Tributaries, Stillwater, Oklahoma.
W79-00677 4A

ARMY ENGINEER DISTRICT, WALLA WALLA, WA.
Nuisance Aquatic Macrophyte Growth,
W79-00769 4A

ARMY ENGINEER DISTRICT, WALLA WALLA, WA. NORTH PACIFIC DIV.
Corps-Wide Conference on Computer-Aided Design in Structural Engineering. Volume V. Gravity Monoliths and U-Frame Locks and Channels,
W79-00708 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.
Preliminary Guide to Wetlands of the Gulf Coastal Plain, Major Associations and Communities Identified.
W79-00536 2I

An Open-Coast Mathematical Storm Surge Model with Coastal Flooding for Louisiana; Report 1, Theory and Application,
W79-00537 8B

Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater (Treatability Study),
W79-00538 5D

Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles,
W79-00539 5C

Georgetown Harbor, South Carolina; Report 1, Hydraulic Salinity, and Shoaling Verification; Hydraulic Model Investigation,
W79-00540 8B

Navigation Conditions at Aliceville Lock and Dam, Mississippi and Alabama, Tombigbee River; Hydraulic Model Investigation,
W79-00541 8B

An Aerial Survey of Waterbird Colonies Along the Upper Mississippi River and Their Relationship to Dredged Material Deposits,
W79-00542 6G

Improvements for Murrells Inlet South Carolina,
W79-00546 8B

Preliminary Guide to Wetlands of Peninsular Florida; Major Associations and Communities Identified.
W79-00547 2I

Prediction of Heavy Metal Uptake by Marsh Plants Based on Chemical Extraction of Heavy Metals from Dredged Material,
W79-00548 5B

Investigation of Subaqueous Borrow Pits as Potential Sites for Dredged Material Disposal,
W79-00550 5E

Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary,
W79-00751 5E

Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; An Environmental Inventory,
W79-00752 5E

Habitat Development Field Investigations, Rennie Island Marsh Development Site Grays Harbor, Washington, Summary Report,
W79-00754 2L

Preliminary Evaluation of Wind and Wave Effects at Potential LNG Terminal Sites, State of California: Appendix A: An Evaluation of the Relative Wave Climate at Five Onshore LNG Sites Considering Island Influences and Topographic Effects,
W79-00756 8B

Preliminary Guide to Wetlands of Puerto Rico, Major Associations and Communities Identified.
W79-00758 2I

Model Studies of the Portugues and Bucana Rivers Channelization, Puerto Rico; Hydraulic Model Investigation,
W79-00761 8B

Capacity Studies of Gallipolis Locks, Ohio River, West Virginia,
W79-00762 8A

Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Evaluative Summary,
W79-00764 5E

U.S. Army Corps of Engineers Fifth Hydrographic Survey Conference.
W79-00766 7B

Effect of Depth on Dredging Frequency; Report 1, Survey of District Offices,
W79-00767 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. CONCRETE LAB.
Engineering Condition Survey and Structural Investigation of Locks and Dam 3, Monongahela River,
W79-00712 8A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. SOILS AND PAVEMENTS LAB.
Investigation of the Liquefaction Potential at the W.G. Huxtable Pumping Plant Site,
W79-00713 8D

ARMY ENGINEERS WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. CONCRETE LAB.
Condition Survey of Lock and Dam 52, Ohio River,
W79-00710 8A

ASIAN INST. OF TECH., BANGKOK (THAILAND). DIV. OF WATER RESOURCES ENGINEERING.
Streamflow Modeling of Upper Indus River Catchments,
W79-00800 4A

ATHENS UNIV. (GREECE). ZOOLOGICAL LAB. AND MUSEUM.
Acute Toxicity of Copper to a Copepod,
W79-00959 5C

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ENVIRONMENTAL BIOLOGY.
Studies on a Saline Lake Ecosystem,
W79-00734 2H

AUTOTROL CORP., MILWAUKEE, WI. (ASSIGNEE).
Activated Sludge Treatment of Wastewater,
W79-00839 5D

BATTELLE COLUMBUS LAB., OH.
A Review of Current Interest and Research in Water Hyacinth-Based Wastewater Treatment,
W79-00786 5G

BATTELLE COLUMBUS LABS., COLUMBUS, OH.
Aquatic Life Field Studies at Badger Army Ammunition Plant, (Final Phase II Report, Volume I),
W79-00916 5C

Aquatic Life Field Studies at Joliet Army Ammunition Plant, (Final Phase II Report, Volume I),
W79-00917 5C

BATTELLE PACIFIC NORTHWEST LABS. SEQUIM, WA, MARINE RESEARCH LAB.
Uptake of Hydrocarbons from Marine Sediments Contaminated with Prudhoe Bay Crude Oil: Influence of Feeding Type of Test Species and Availability of Polycyclic Aromatic Hydrocarbons,
W79-00730 5C

BECK (R. W.) AND ASSOCIATES, DENVER, CO.
A Mechanical Test Procedure for Avalanche Snow,
W79-00698 2C

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Sensitivity of Coastal Waters to Anthropogenic Trace Metal Emissions,
W79-00946 5A

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.
Residues of Bunker C Oil in Chedabucto Bay, Nova Scotia, 6 Years after the Arrow Spill,
W79-00721 5A

Alterations in Growth and Physiology of Soft-Shell Clams, Mya Arenaria, Chronically Oiled with Bunker C from Chedabucto Bay, Nova Scotia, 1970-76,
W79-00733 5C

BEN GURION UNIV. OF THE NEGEV, BEERSHEBA (ISRAEL). RESEARCH AND DEVELOPMENT AUTHORITY.
Management of Brackish Waters in Arid Land Agriculture: Modern Experiences with Ancient Problems,
W79-00810 3C

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA).
Dissipation of Heat from Cooling Ponds,
W79-00702 5B

BOWDOIN COLL., BRUNSWICK, ME. DEPT. OF CHEMISTRY; AND BIGELOW LAB. FOR OCEAN SCIENCES, BOOTHBAY HARBOR, ME.
Weathering Characteristics of Petroleum Hydrocarbons Deposited in Fine Clay Marine Sediments, Searsport, Maine,
W79-00724 5C

BRITISH ANTARCTIC SURVEY, CAMBRIDGE (ENGLAND).
Thermal Stress Near the Surface of a Glacier,
W79-00686 2C

The Spatial Distribution of 10 M Temperatures in the Antarctic Peninsula,
W79-00689 2C

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY.
On Tidal Propagation in Shallow Rivers,
W79-00701 2L

Relationship Between Cytoplasmic Distribution of Mercury and Toxic Effects to Zooplankton and Chum Salmon (Oncorhynchus keta) Exposed to Mercury in a Controlled Ecosystem,
W79-00892 5C

BROWN, BOVERI AND CO. LTD., BADEN (SWITZERLAND). (ASSIGNEE).
Thermal Power Station Combined with a Plant for Seawater Desalination,
W79-00846 3A

BRUSSELS UNIV. (BELGIUM). LAB. DE GEOMORPHOLOGIE.
Origin of the Basal Ice Layer from Alpine Glaciers Indicated by Its Chemistry,
W79-00690 2C

BUREAU OF RECLAMATION, DENVER, CO. ENGINEERING AND RESEARCH CENTER.
Bicycle-Safe Grate Inlets Study. Volume I - Hydraulic and Safety Characteristics of Selected Grate Inlets on Continuous Grades,
W79-00714 8B

CAIFORNIA UNIV., RIVERSIDE. DIV. OF BIOLOGICAL CONTROL.
Tilapia--A Management Tool for Biological Control of Aquatic Weeds and Insects,
W79-00592 5G

CALIFORNIA INST. OF TECH., PASADENA. W. M. KECK LAB. OF HYDRAULICS AND WATER RESOURCES.
Mathematical Model for Multiple Cooling Tower Plumes,
W79-00876 5B

CALIFORNIA UNIV., BERKELEY. DEPT. OF FORESTRY AND CONSERVATION.
The Use of Benthic Macroinvertebrates as Indicators of Logging Impact on Streams with an Evaluation of Buffer Strip Effectiveness,
W79-00898 4C

CALIFORNIA UNIV., BERKELEY. NAVAL BIOSCIENCES LAB.
Antiviral Substances from California Marine Algae,
W79-00590 3C

CALIFORNIA UNIV., BERKELEY. SANITARY ENGINEERING RESEARCH LAB.
Feasibility of Rainwater Collection Systems in California,
W79-00855 3B

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
A Method of Using Irrigation Drainage Water for Power Plant Cooling,
W79-00862 5D

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB., AND CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
University of California Saline Water Conversion Research.
W79-00875 3A

CALIFORNIA UNIV., BERKELEY. SEAWATER CONVERSION LAB.
Vapor Compression Vertical Tube Foam Evaporation,
W79-00680 3A

CALIFORNIA UNIV., BERKELEY. SPACE SCIENCES LAB.
An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques.
W79-00711 7B

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Impact of Fossil Energy Alternatives on California Irrigated Agriculture,
W79-00908 6B

CALIFORNIA UNIV., DAVIS. DEPT. OF ANIMAL SCIENCE.
The Effects of Temperature on the Growth and Survival of Larval and Juvenile Crayfish, Pacifastacus Leniusculus,
W79-00909 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Decision Theory Applications and Irrigation Optimization,
W79-00857 3F

Interferences in Trace Contaminant Removal by Adsorption from Water for Groundwater Recharge,
W79-00858 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
The Effects of Irrigation Return Water on Aquatic Plants (Periphyton) in the Sacramento River at Knights Landing, California,
W79-00914 5C

CALIFORNIA UNIV., DAVIS. DIV. OF ENVIRONMENTAL STUDIES.
Effects of a Coastal Front on the Distribution of Chlorophyll in Lake Tahoe, California-Nevada,
W79-00699 5B

CALIFORNIA UNIV., IRVINE. DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY.
Influence of Domestic Wastes on Energetic Pathways in Rocky Intertidal Communities,
W79-00969 5C

CALIFORNIA UNIV., IRVINE. SCHOOL OF ENGINEERING.
An Outline for the Study of Emergency Water Allocation Procedures,
W79-00921 4A

A Conceptual Model of the Water Delivery System in the San Diego Area,
W79-00922 4A

The Current State of Emergency Planning for Water Supply in the San Diego Area,
W79-00923 4A

Emergency Water Allocation Literature: Sources and Retrieval,
W79-00924 4A

EWAP Data Access System - A Manual for the Use of the Edge Punch Card File,
W79-00925 4A

The Trenton Water Crisis of 1975: Impressions and Analysis,
W79-00926 4A

CALIFORNIA UNIV., IRVINE. SCHOOL OF ENGINEERING; AND CALIFORNIA UNIV., IRVINE. GRADUATE SCHOOL OF ADMINISTRATION.
Working Paper Nos. 7 - 10 of the Emergency Water Allocation Project, (7) Implementation of a Preparedness Program; (8) Achieving Equitable and Effective Water Allocation; (9) Restoration of a Water Distribution Network; (10) Improving Emergency Preparedness,
W79-00919 4A

Working Paper No. 11 of the Emergency Water Allocation Project, Manual for Water Service Emergencies for the Poway Municipal Water District,
W79-00920 4A

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Economic Benefits to Agriculture in the San Joaquin Valley Due to Long-Term Prediction Streamflow Forecasting,
W79-00861 3F

CALIFORNIA UNIV., LOS ANGELES. ENVIRONMENTAL SCIENCE AND ENGINEERING.
Wilderness Water Quality: Bishop Creek Baseline Study, 1974,
W79-00859 5G

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
Optimization of Real-Time Hourly Operations of a Complex, Multiple Purpose Reservoir System,
W79-00501 6A

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL AND ENVIRONMENTAL SCIENCES.
Nitrate-Nitrogen in Effluent from Agricultural Tile Drains in California,
W79-00574 5B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
The Adsorption-Desorption of Diuron by Freshwater Sediments,
W79-00860 5B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURE ENGINEERING.
Nitrogen Fertilizer Management of a Lemon Orchard as Related to Nitrate-Pollution Potential of Ground Water,
W79-00899 5B

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. INST. OF MARINE RESOURCES.
Particularate Organic Matter in Surface Waters Off Southern California and Its Relationship to Phytoplankton,
W79-00581 5C

Workshop in Instrumentation for Nearshore Processes. June 16-17, 1977, La Jolla, California,
W79-00997 2L

CALIFORNIA UNIV., SANTA BARBARA. COLL. OF ENGINEERING.
Galerkin Method for a Non-Linear Parabolic Equation with Mixed Non-Linear Boundary Conditions,
W79-00900 2G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF ECONOMICS.
A Dynamic Simulation of Regional Economic Performance with Alternative Water Policies,
W79-00854 6B

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF GEODESY AND GEOPHYSICS.
Recording Wire Strainmeters on the Barnes Ice Cap, Baffin Island, Canada,
W79-00696 2C

CARNEGIE-MELLON UNIV., PITTSBURGH, PA. GRADUATE SCHOOL OF INDUSTRIAL ADMINISTRATION.
Bureaucrats VS. Voters: on the Political Economy of Resource Allocation by Direct Democracy,
W79-00793 6E

CENTRAL ELECTRICITY GENERATING BOARD, SOUTHAMPTON (ENGLAND). MARINE LAB.
A Versatile Pump-Sampler for Live Zooplankton,
W79-00949 7B

CENTRE HOSPITALO-UNIVERSITAIRE-POITIERS (FRANCE). BACTERIOLOGY VIROLOGY LAB.
Microbiological Study of a Hypersaline Lake in French Somaliland,
W79-00523 5C

CENTRE OF ADVANCED STUDY IN MARINE BIOLOGY POROT NOVO (INDIA).
Toxicity of Copper to Three Estuarine Bivalves,
W79-00974 5C

CH2M HILL, DENVER, CO.
Facilities Plan Administrative Report for Lead-Deadwood, Sanitary District No. 1, Deadwood, South Dakota.
W79-00707 5D

CHALMERS UNIV. OF TECHNOLOGY, GOTEBORG (SWEDEN). VATTEN INST. TEK.
Measures Against Storm Water Pollution, (In Swedish),
W79-00726 5G

CHERKASSKII PEDAGOGICAL INST. (USSR). DIV. OF BOTANY.
Algae of Biological Ponds of the Cherkassy Chemical Industry (In Ukranian),
W79-00611 5C

CLEVELAND STATE UNIV., OH. DEPT. OF BIOLOGY.
The Fresh-Water Polychaete, Manayunkia Speciosa, in a Thermal Channel, Cleveland Harbor Lake Erie.
W79-00985 5C

COLLEGE OF THE VIRGIN ISLAND, ST. THOMAS. CARIBBEAN RESEARCH INST.
Problem-Research Analysis in the U.S. Virgin Islands Insular Region, Atlantic Subregion,
W79-00511 6B

COMMANCHE ENGINEERING CORP., ROCKWELL CITY, IA. (ASSIGNEE).
Sewage Treatment Device,
W79-00833 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, BRISBANE (AUSTRALIA). LONG POCKET LABS.
An Approach to Estimating the Standing Crop of Waterhyacinth,
W79-00779 5G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND RESOURCES MANAGEMENT, CANBERRA (AUSTRALIA).
Desertification in the Pastoral Rangelands of the Gascoyne Basin, Western Australia,
W79-00814 3F

CONCENTRATION SPECIALISTS, INC., ANDOVER, MA.
A Process and Pilot Plant Design Study of the Absorption Freezing Vapor Compression Process,
W79-00507 3A

CONCEPCION UNIV. (CHILE). DEPT. OF BOTANY.
Limnological Study of the Chica de san Pedro, La Posada and Lo Mendez Lagoons: I. Quantitative and Qualitative Analysis of Winter Plankton (In Spanish),
W79-00558 5C

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W79-00577 5C

CONNECTICUT UNIV., STORRS. BIOLOGICAL SCIENCES GROUP.
Detritus in the Lake Ecosystem,
W79-00552 5C

CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, IL.
Environmental Impact Computer System Attribute Descriptor Package, Reference Document.
W79-00652 7A

CORPS OF ENGINEERS, WASHINGTON, DC.
Chemical Control of Hydrilla,
W79-00776 5G

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY; AND NEWCASTLE UPON TYNE UNIV. (ENGLAND).
Long-Term Effects of Oil Spills on Marine Intertidal Communities,
W79-00749 5C

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
The Shoaling of Breakwater Harbor, Cape Henlopen Area, Delaware Bay, 1842 to 1971,
W79-00996 2L

DENVER REGIONAL COUNCIL OF GOVERNMENTS, CO.
Interim Plan for Water Quality Management in the Denver Metropolitan Area.
W79-00656 5G

DEP. PARASITOL, SCH. MED., TEIKYO UNIV., KAGA, ITABASHI, TOKYO, JAP.
Studies on the Effectiveness of the Guppy Poecilia Reticulata in Controlling Culex Pipiens S.L.: II. Efficiency of Predation in Breeding Habitats, (In Japanese),
W79-00889 5G

Studies on Effectiveness of Guppy Peocilia Reticulata in Controlling Culex Pipiens S.L.: III. Field Evaluation of Control Methods Using Guppy Larvicide, or Guppy-Larvicide, (In Japanese),
W79-00890 5G

DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). ENGINEERING RESEARCH SERVICE.
Runoff from Feedlots and Manure Storages in Southern Ontario,
W79-00570 5B

DEPARTMENT OF ENVIRONMENT, HOUSING AND COMMUNITY DEVELOPMENT, CANBERRA(AUSTRALIA).
Non-Agricultural Land Use and Desertification,
W79-00806 4A

DESERT INST., ASHKHADAD (USSR).
Desert Development in the V. I. Lenin Karakum Canal Zone,
W79-00805 4A

DOW CHEMICAL CO., MIDLAND, MI. ENVIRONMENTAL SCIENCES RESEARCH LAB.
Toxicity of Perchloroethylene, Trichloroethylene, 1,1,1-Trichloroethane and Methylene Chloride to Fathead Minnows,
W79-00939 5A

ECODYNE CORP., LINCOLNSHIRE, IL. (ASSIGNEE).
Acid Dispenser for Water Softener Unit,
W79-00824 5F

EIDGENOESSICHE INST. FUR SCHNEE- UND LAWINENFORSCHUNG, DAVOS (SWITZERLAND).
An Alternate Statistical Interpretation of the Strength of Snow,
W79-00692 2C

EIDGENOSSISCHE INST. FUR SCHNEE- UND LAWINENFORSCHUNG, DAVOS (SWITZERLAND).
Determination of the Mean Number of Bonds Per Snow Grain and of the Dependence of the Tensile Strength of Snow on Stereological Parameters,
W79-00691 2C

EISENHOWER COLL., SENECA FALLS, NY. DEPT. OF BIOLOGY.
The Distribution of Aquatic Weeds in the Finger Lakes of New York State and Recommendations for their Control,
W79-00787 5G

ENVIRONMENT INFORMATION CENTER, INC., NEW YORK.
Where Do Environmental Laws and Regulations Stand Today.,
W79-00607 5G

ENVIRONMENTAL PROTECTION AGENCY, ATLANTA, GA. REGION IV.
Draft Environmental Impact Statement, North Fulton County and Northeast Cobb County, Georgia.
W79-00653 6G

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Analytical Report New Orleans Area Water Supply Study.
W79-00981 5A

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W79-00661 5G

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W79-00983 5G

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR. INFRARED AND OPTICS DIV.
Tidal Affected Distributions of Surface Chlorophyll and Transparency in the New York Bight,
W79-00933 5B

ENVIRONMENTAL RESEARCH LAB., GULF BREEZE, FL.; AND ENVIRONMENTAL RESEARCH LAB., JOHNS ISLAND, SC. BEARS BLUFF FIELD STATION.
The Effect of Prehatch and Posthatch Exposures to Cadmium on Salinity Tolerance of Larval Grass Shrimp, Palaemonetes Pugio,
W79-00947 5C

FISH AND WILDLIFE SERVICE, LAUREL, MD. PATUXENT WILDLIFE RESEARCH CENTER.
Avian Chlorea and Organochlorine Residues in an American Oystercatcher,
W79-00948 5B

FISH AND WILDLIFE SERVICE, WARM SPRINGS, GA. SOUTHEASTERN FISH CONTROL LAB.
Uptake, Distribution, and Elimination of the Lampricide 2', 5-Dichloro-4'-Nitro(14C) Salicylanilide (Bayer 2353) and its 2-Aminoethanol Salt (Bayer 73) by Largemouth Bass,
W79-00951 5B

FISH AND WILDLIFE SERVICE, YANKTON, SD.
Zooplankton Standing Crops in the Discharge of Lake Francis Case, 1966-1972,
W79-00551 5C

FLORIDA STATE GAME AND FRESH WATER FISH COMMISSION, EUSTIS. EUSTIS FISHERIES RESEARCH LAB.
Toxicity of Sulfuric Acid to Aquatic Plants and Organisms,
W79-00777 5C

Comparative Effects of Grass Carp and Selected Herbicides on Macrophyte and Phytoplankton Communities,
W79-00778 5C

FLORIDA UNIV., GAINESVILLE.
The Effect of Daylength and Temperature on Hydrilla Growth and Tuber Production,
W79-00781 5C

FLORIDA UNIV., GAINESVILLE. DEPT. OF AGRICULTURAL ENGINEERING.
Pollution in Runoff from Nonpoint Sources,
W79-00527 5B

Aquatic Forage Processing in Florida,
W79-00531 4A

FLORIDA UNIV., GAINESVILLE. DEPT. OF GEOLOGY.
Dolomitization in the Floridan Aquifer,
W79-00532 2F

FLORIDA UNIV., GAINESVILLE. DEPT. OF PLANT PATHOLOGY.
Biological Control of Aquatic Weeds with Plant Pathogens,
W79-00534 4A

FLORIDA UNIV., GAINESVILLE. DEPT. OF SOIL SCIENCE.
Soil Water Movement and Uptake by Plants During Water Infiltration and Redistribution,
W79-00535 2G

FLORIDA UNIV., GAINESVILLE. INST. OF FOOD AND AGRICULTURAL SCIENCES.
Hydrilla Silage Production, Composition and Acceptability,
W79-00773 5G

FLORIDA UNIV., QUINCY.
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W79-00530 5B

FOREST SERVICE (USDA), COLLEGE, AK. INST. OF NORTHERN FORESTRY.
Kolyma Water Balance Station, Magadan Oblast, Northeast U.S.S.R.: United States-Soviet Scientific Exchange Visit,
W79-00716 4D

FRESHWATER BIOLOGICAL ASSOCIATION, AMBLESIDE (ENGLAND).
Seston and Sediment Formation in Five Lake District Lakes,
W79-00738 5C

FULTON COUNTY PLANNING DEPT. JOHNSTOWN, NY.
Hydrology, Fulton County, New York,
W79-00663 4A

Streams and Drainage Basins, Fulton County, New York,
W79-00664 4A

GALLAGHER (BRIAN J.) AND CO., LOS ANGELES, CA.
Investigation of Containment Area Design to Maximize Hydraulic Efficiency.
W79-00757 5E

GDANSK UNIV. (POLAND). BIOLOGICAL STATION AT GORKI WSCHODNIE.
Studies of the Toxicity of Phospho-Gypsum,
W79-00748 5C

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Potential Effects of Deep-Well Waste Disposal in Western New York,
W79-00625 5B

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The Quality Assurance Program of a National Laboratories System,
W79-00621 5A

GEOLOGICAL SURVEY, ALBUQUERQUE, NM. WATER RESOURCES DIV.
Ground-Water Depletion, in Feet, Allowed in a Part of Curry County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00627 7C

Ground-Water Depletion, in Feet, Allowed in Northern Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00628 7C

Ground-Water Depletion, in Feet, Allowed in Central Lea County, New Mexico, by U.S. Internal Revenue Service for Calendar year 1977,
W79-00629 7C

Ground-Water Depletion, in Feet, Allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for Calendar Year 1977,
W79-00630 7C

GEOLOGICAL SURVEY, BISMARCK, ND. WATER RESOURCES DIV.
Water Resources Data for North Dakota, Water Year 1977.
W79-00643 7C

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Water Resources Data for Hawaii and Other Pacific Areas, Water Year 1977--Volume 2. Trust Territory of the Pacific Islands, Guam, American Samosa, and Northern Mariana Islands.
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Effects of Permafrost on Stream Channel Behavior in Arctic Alaska,
W79-00623 2C

GEOLOGICAL SURVEY, LANSING, MI. WATER RESOURCES DIV.
Water Resources Data for Michigan, Water Year 1977.
W79-00642 7C

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Statistical Summary of Streamflow Data for Kansas Streams in the Arkansas River Basin,
W79-00626 7C

GEOLOGICAL SURVEY, LINCOLN, NE. WATER RESOURCES DIV.
Water Resources Data for Nebraska, Water Year 1977.
W79-00644 7C

GEOLOGICAL SURVEY, LUBBOCK, TX. WATER RESOURCES DIV.
Field Determination of Vertical Permeability to Air in the Unsaturated Zone,
W79-00624 2G

Toward a Rational Development of Artificial-Recharge Research,
W79-00632 4B

GEOLOGICAL SURVEY, MENLO PARK, CA. WATER RESOURCES DIV.
Modeling of Hydraulic Systems by Finite-Element Methods,
W79-00634 2A

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W79-00635 2L

GEOLOGICAL SURVEY, ORLANDO, FL. WATER RESOURCES DIV.
Hydrologic Reconnaissance of Tsala Apopka Lake, Citrus County, Florida,
W79-00639 7C

GEOLOGICAL SURVEY, PORTLAND, OR. WATER RESOURCES DIV.
Availability and Quality of Ground Water in the Winston Area, Douglas County, Oregon,
W79-00620 7C

A Method for Estimating the Regional Effects of Land Use on River-Water Quality, Susquehanna River Basin, Pennsylvania and New York,
W79-00622 5C

GEOLOGICAL SURVEY, RALEIGH, NC. WATER RESOURCES DIV.
Water Resources of Northeast North Carolina,
W79-00631 7C

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W79-00637 2K

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On the Design of Hydrologic Data Networks,
W79-00636 7A

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Floods in Kansas City, Missouri and Kansas, September 12-13, 1977,
W79-00638 4A

GEORGETOWN UNIV., WASHINGTON, DC. DEPT. OF BIOLOGY.
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W79-00506 5C

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W79-00995 5G

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W79-00783 5C

GEORGIA UNIV., SAPELO ISLAND. MARINE INST.
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W79-00545 2I

GRAHAM (JOHN) CO., SEATTLE, WA.
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W79-00750 5E

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W79-00816 2B

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W79-00657 2L

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IFO A. B., BROMOLLA (SWEDEN). (ASSIGNEE).
Device for Purifying Sewer Water in Small Sewer Systems,
W79-00843 5D

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W79-00789 5G

ILLINOIS STATE WATER SURVEY, URBANA. DEPT. OF REGISTRATION AND EDUCATION.
Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes,
W79-00918 5C

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Analysis of Erosion and Sedimentation, Seven Mile Creek Southwest Branch Watershed,
W79-00791 6B

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. INST. FOR ENVIRONMENTAL STUDIES.
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W79-00954 5B

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W79-00882 5D

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W79-00784 5C

INST. HYDROBIOL., ACAD. SCI. UKR. SSR KIEV, USSR.
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W79-00905 5D

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W79-00580 5A

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Iowa Water Quality Management Plan: Des Moines River Basin,
W79-00645 5G

Iowa Water Quality Management Plan: Supporting Document,
W79-00646 5G

Iowa Water Quality Management Plan: Northeastern Iowa Basin.
W79-00647 5G

Iowa Water Quality Management Plan: Western Iowa Basin.
W79-00648 5G

Iowa Water Quality Management Plan: Skunk River Basin.
W79-00649 5G

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W79-00651 5G

IOWA STATE UNIV., AMES.
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W79-00502 5E

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W79-00510 5C

IOWA UNIV., IOWA CITY.
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W79-00906 4C

JAYCOR, ALEXANDRIA, VA.
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W79-00817 5G

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
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W79-00565 5C

KANSAS STATE TEACHERS COLL., EMPORIA. DEPT. OF BIOLOGY.
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W79-00991 5A

KANSAS STATE UNIV., MANHATTAN. EVAPOTRANSPIRATION LAB.
Field Chamber Measurements of CO2 Flux from Soil Surface,
W79-00871 2K

KANSAS STATE UNIV., MANHATTAN. INST. FOR SYSTEMS DESIGN AND OPTIMIZATION.
Optimal Control of Cooling Water Discharge from a Power Plant,
W79-00870 5G

KANSAS UNIV., LAWRENCE. INST. FOR SOCIAL AND ENVIRONMENTAL STUDIES.
Optimum Depletion of Natural Resources: Some General Issues,
W79-00587 6B

KENT STATE UNIV., OH. DEPT. OF BIOLOGICAL SCIENCES.
The Occurrence of Internal Phosphorus Loading in Two Small, Eutrophic Glacial Lakes in Northeastern Ohio,
W79-00560 5C

KENTUCKY UNIV., LEXINGTON. DEPT. OF CIVIL ENGINEERING.
Channel Routing by Finite Difference Method,
W79-00704 8B

KENTUCKY UNIV., LEXINGTON. DEPT. OF ECONOMICS.
Environmental Data Management: The Identification of Outliers,
W79-00863 5G

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
A Proposed Revision of Kentucky's Water Rights Legislation,
W79-00524 6E

Effects of Soil Injection of Liquid Dairy Manure on the Quality of Surface Runoff,
W79-00528 5B

KHARTOUM UNIV. (SUDAN).
Effect of PH on the Nature of Competition Between Eichhornia Crassipes and Pistia Stratiotes,
W79-00780 5C

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W79-00732 5C

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Method for Treatment of Oil-Containing Waste Water by Using an Oil Adsorbent,
W79-00850 5D

LAB. HYDROBIOL., ORSTOM, N'DJAMENA, CHAD.
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W79-00884 5C

Phytoplankton from Alkaline Waters of Kanem (CHAD): VIII. Classification of Environments Studied and Characteristic Species, (In French),
W79-00893 2H

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Dielectric Behaviour of Disperse Ice Microcrystals in the Frequency Range 100,000 to 0.01 Hz,
W79-00693 2C

LABORATORIUM RYBARSTVA A HYDROBIOLOGIE, BRATISLAVA (CZECHOSLOVAKIA).
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W79-00718 6B

LAJOS KOSSUTH UNIV., DEBRECEN (HUNGARY). ZOOLOGICAL INST.
Data Toward the Understanding of the Hydrobiological Status of Dead Tributary of the Bodrog Near Sarospatak: III. Flora and Fauna, (In German),
W79-00804 2I

LEEDS UNIV. (ENGLAND). DEPT. OF PLANT SCIENCES.
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W79-00569 5C

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Dounreay Oil Spill: Major Implications of a Minor Incident,
W79-00961 5C

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
Mechanical Dispersal of Oil Stranded in the Littoral Zone,
W79-00725 5G

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF MARINE SCIENCE.
Contribution of Nutrients from Sediments and Interstitial Water to Colville River System, Alaska,
W79-00989 2K

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W79-00735 5C

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W79-00589 5G

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W79-00937 5B

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Flows of Materials Between Poorly Flooded Tidal Marshes and Estuary,
W79-00987 5C

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To Tell the Truth: Imperfect Information and Optimal Pollution Control,
W79-00588 5G

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W79-00929 5C

MASSACHUSETTS UNIV., AMHERST. DEPT. OF LANDSCAPE ARCHITECTURE AND REGIONAL.
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W79-00873 6B

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W79-00666 5G

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Installation for the Mechanical-Biological Purification of Waste Water,
W79-00825 5D

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W79-00682 5G

Culture of Channel Catfish in a High Flow Recirculating System,
W79-00683 5G

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W79-00878 5C

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W79-00768 5C

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W79-00717 4D

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W79-00915 5C

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W79-00982 5B

MIDWEST RESEARCH INST., MINNETONKA, MN. NORTH STAR DIV.
Research on In Situ-Formed Condensation Polymer for Reverse Osmosis Membranes,
W79-00907 3A

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Supplying the Island of Fuerteventura with Sea Water (Abastecimiento A La Isla De Fuerteventura Con Aguas Procedentes Del Mar),
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W79-00563 5C

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W79-00753 5C

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W79-00938 5C

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W79-00979 5C

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Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions,
W79-00763 5B

UNIVERSITY OF WALES INST. OF SCIENCE AND TECHNOLOGY, CARDIFF. CENTRE FOR MARINE LAW AND POLICY.
The Continental Shelf and the Exclusive Economic Zone: The Problem of Delimitation at UNCLOS III,
W79-00594 6E

UNIVERSITY OF WALES INST. OF SCIENCE AND TECHNOLOGY, CARDIFF. DEPT. OF APPLIED BIOLOGY.
A Review of the Biology of British Naididae (Oligochaeta) with Emphasis on the Lotic Environment,
W79-00971 5C

UNIVERSITY OF WEST FLORIDA, PENSACOLA. DEPT. OF BIOLOGY.
Some Aspects of Redox Trends in the Bottom Muds of a Mesotrophic Bayou Estuary,
W79-00533 5C

UPPSALA UNIV. (SWEDEN). INST. OF LIMNOLOGY.
Enzymatic Release of Phosphate in Water from Subarctic Lakes in Northern Sweden,
W79-00559 5C

UPPSALA UNIV. (SWEDEN). INST. OF ZOOPHYSIOLOGY.
Polychlorinated Biphenyls in the Biomass of the Baltic,
W79-00953 5B

URBAN SYSTEMS RESEARCH AND ENGINEERING, INC., CAMBRIDGE, MA.
Planning and Institutional Considerations in Wastewater Treatment Facilities Planning, Boston, Massachusetts. Phase 1 Study,
W79-00667 5D

UTAH CENTER FOR WATER RESOURCES RESEARCH, LOGAN.
Water Conservation Information Dissemination During 1977 Drought Emergency,
W79-01000 3B

UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Impact of Energy Development on Colorado River Water Quality,
W79-00605 5G

VIRGINIA INST. OF MARINE SCIENCES, GLOUCESTER POINT.
Acute Toxicity of Bromochlorinated Seawater to Selected Estuarine Estuarine Species with a Comparison to Chlorinated Seawater Toxicity,
W79-00972 5C

VOLGOGRADSKII GOSUDARSTVENNYI MEDITSINSKII INST. (USSR). DIV. OF BIOLOGY.
Schistosomiasis Distribution in the Yemen Arab Republic (In Russian),
W79-00633 5C

WARSAW UNIV. (POLAND), DEPT. OF ENVIRONMENTAL MICROBIOLOGY.
Degradation of Urea by Bacteria and Algae in Mass Algal Cultures,
W79-00573 5D

WARSAW UNIV. (POLAND). DEPT. OF HYDROBIOLOGY.
Food Size Selection and Seasonal Succession of Filter Feeding Zooplankton in an Eutrophic Lake,
W79-00554 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Trace Metal Baselines in the DOMES Study Area,
W79-00887 5B

A Plankton Net Designed to Exclude Air-Sea Interface Phenomena,
W79-00943 7B

WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL).
The Problem of Water,
W79-00795 3B

WESTERN AUSTRALIA DEPT. OF CONSERVATION AND ENVIRONMENT, PERTH.
Salinisation in the Southwest of Western Australia,
W79-00803 3C

WESTERN AUSTRALIAN MUSEUM, PERTH.
Zonation of Marine Gastropods on a Rocky Intertidal Shore in the Admiralty Gulf, Western Australia, with Emphasis on the Genus Nerita,
W79-00555 5C

WESTINGHOUSE ELECTRIC CORP., GATEWAY CENTER, PA. (ASSIGNEE).
Water Purification Method,
W79-00847 5D

WISCONSIN UNIV.-MADISON. DEPT. OF BOTANY.
Macrophyte Control by Harvesting and Herbicides: Implications for Phosphorus Cycling in Lake Wingra, Wisconsin,
W79-00771 5G

WISCONSIN UNIV.-MADISON. DEPT. OF ENTOMOLOGY.
Effects of Antimycin on Stream Insects,
W79-00525 5C

WISCONSIN UNIV.-MADISON. LAB. OF LIMNOLOGY.
Light Responses of Daphnia Pulex,
W79-00566 5C

Seston Dynamics and Tripton Sedimentation in the Pelagic Zone of a Shallow Eutrophic Lake,
W79-00567 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA.
Florida Oil Spill Impact on the Buzzards Bay Benthic Fauna: West Falmouth,
W79-00743 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA; AND MARINE BIOLOGICAL LAB., WOODS HOLE, MA.
No. 2 Fuel Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh,
W79-00744 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA. DEPT. OF BIOLOGY.
Influence of Environmental Contamination on Cytochrome P-450 Mixed-Function Oxygenases in Fish: Implications for Recovery in the Wild Harbor Marsh,
W79-00739 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA. DEPT. OF BIOLOGY; AND

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA. DEPT. OF CHEMISTRY.
Analyses of Aromatic Hydrocarbons in Intertidal Sediments Resulting from Two Spills of No. 2 Fuel Oil in Buzzards Bay, Massachusetts,
W79-00719 5A

YALE UNIV., NEW HAVEN, CT. DEPT. OF GEOLOGY AND GEOPHYSICS.
Field Study of the Mechanics of the Placement of Dredged Material at Open-Water Disposal Sites,
W79-00755 5E

ZOOLOGISCHES FORSCHUNGSINSTITUT UND MUSEUM ALEXANDER KOENIG, BONN (WEST GERMANY).
Ichthyological and Hydrological Observations and Studies on Yarina Cocha, Near Pucallpa and on the Rio Pacaya (Central and Lower Ucayali, E Peru), (In German),
W79-00668 5C

ACCESSION NUMBER INDEX

W79-00501 6A
W79-00502 5E
W79-00503 5A
W79-00504 5C
W79-00505 6D
W79-00506 5C
W79-00507 3A
W79-00508 2F
W79-00509 5A
W79-00510 5C
W79-00511 6B
W79-00512 6E
W79-00513 2H
W79-00514 2H
W79-00515 2L
W79-00516 3F
W79-00517 5G
W79-00518 5G
W79-00519 5C
W79-00520 2K
W79-00521 6A
W79-00522 5C
W79-00523 5C
W79-00524 6E
W79-00525 5C
W79-00526 2A
W79-00527 5B
W79-00528 5B
W79-00529 2I
W79-00530 5B
W79-00531 4A
W79-00532 2F
W79-00533 5C
W79-00534 4A
W79-00535 2G
W79-00536 2I
W79-00537 8B
W79-00538 5D
W79-00539 5C
W79-00540 8B
W79-00541 8B
W79-00542 6G
W79-00543 6G
W79-00544 6G
W79-00545 2I
W79-00546 8B
W79-00547 2I
W79-00548 5B
W79-00549 5C
W79-00550 5E
W79-00551 5C
W79-00552 5C
W79-00553 5C
W79-00554 5C
W79-00555 5C
W79-00556 5C
W79-00557 5C
W79-00558 5C
W79-00559 5C
W79-00560 5C
W79-00561 5C
W79-00562 5C
W79-00563 5C
W79-00564 5C
W79-00565 5C
W79-00566 5C
W79-00567 5C
W79-00568 5C
W79-00569 5C
W79-00570 5B
W79-00571 5C
W79-00572 5C
W79-00573 5D
W79-00574 5B
W79-00575 5C
W79-00576 5G
W79-00577 5C
W79-00578 5C
W79-00579 5C
W79-00580 5A
W79-00581 5C
W79-00582 6B
W79-00583 6C
W79-00584 6B
W79-00585 5C
W79-00586 6G
W79-00587 6B
W79-00588 5G
W79-00589 5G
W79-00590 3C
W79-00591 5G
W79-00592 5G
W79-00593 6B
W79-00594 6E
W79-00595 5C
W79-00596 6B
W79-00597 6B
W79-00598 6B
W79-00599 6E
W79-00600 6E
W79-00601 6E
W79-00602 6E
W79-00603 6E
W79-00604 6E
W79-00605 5G
W79-00606 5A
W79-00607 5G
W79-00608 6E
W79-00609 7B
W79-00610 5B
W79-00611 5C
W79-00612 2I
W79-00613 4B
W79-00614 5B
W79-00615 6E
W79-00616 6E
W79-00617 5G
W79-00618 5G
W79-00619 5G
W79-00620 7C
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W79-00624 2G
W79-00625 5B
W79-00626 7C
W79-00627 7C
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W79-00629 7C
W79-00630 7C
W79-00631 7C
W79-00632 4B
W79-00633 5C
W79-00634 2A
W79-00635 2L
W79-00636 7A
W79-00637 2K
W79-00638 4A
W79-00639 7C
W79-00640 7C
W79-00641 7C
W79-00642 7C
W79-00643 7C
W79-00644 7C
W79-00645 5G
W79-00646 5G
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W79-00648 5G
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W79-00650 5G
W79-00651 5G
W79-00652 7A
W79-00653 6G
W79-00654 6G
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W79-00659 5B
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W79-00661 5G
W79-00662 5C
W79-00663 4A
W79-00664 4A
W79-00665 5G
W79-00666 5G
W79-00667 5D
W79-00668 5C
W79-00669 4A
W79-00670 4A
W79-00671 4A
W79-00672 4A
W79-00673 4A
W79-00674 4A
W79-00675 4A
W79-00676 4A
W79-00677 4A
W79-00678 6C
W79-00679 2G
W79-00680 3A
W79-00681 1A
W79-00682 5G
W79-00683 5G
W79-00684 10A
W79-00685 2B
W79-00686 2C
W79-00687 2C
W79-00688 2C
W79-00689 2C
W79-00690 2C
W79-00691 2C
W79-00692 2C
W79-00693 2C
W79-00694 2C
W79-00695 2C
W79-00696 2C
W79-00697 2C
W79-00698 2C
W79-00699 5B
W79-00700 2C
W79-00701 2L
W79-00702 5B
W79-00703 4A
W79-00704 8B
W79-00705 2C
W79-00706 7C
W79-00707 5D
W79-00708 8B
W79-00709 2F
W79-00710 8A
W79-00711 7B
W79-00712 8A
W79-00713 8D
W79-00714 8B
W79-00715 4B
W79-00716 4D
W79-00717 4D
W79-00718 6B
W79-00719 5A
W79-00720 5C
W79-00721 5A
W79-00722 5A
W79-00723 5C
W79-00724 5C
W79-00725 5G
W79-00726 5G
W79-00727 5D
W79-00728 5D
W79-00729 5D
W79-00730 5C
W79-00731 5D
W79-00732 5C
W79-00733 5C
W79-00734 2H
W79-00735 5C
W79-00736 5G
W79-00737 5C
W79-00738 5C
W79-00739 5C
W79-00740 5G
W79-00741 5C
W79-00742 5C
W79-00743 5C
W79-00744 5C
W79-00745 5C
W79-00746 5C
W79-00747 5C
W79-00748 5C
W79-00749 5C
W79-00750 5E
W79-00751 5E
W79-00752 5E
W79-00753 5C
W79-00754 2L
W79-00755 5E
W79-00756 8B
W79-00757 5E
W79-00758 2I
W79-00759 5E
W79-00760 5E
W79-00761 8B
W79-00762 8A
W79-00763 5B
W79-00764 5E
W79-00765 2H
W79-00766 7B
W79-00767 4A
W79-00768 5C
W79-00769 4A
W79-00770 4A
W79-00771 5G
W79-00772 5G
W79-00773 5G
W79-00774 4A
W79-00775 5C
W79-00776 5G
W79-00777 5C
W79-00778 5C
W79-00779 5G
W79-00780 5C
W79-00781 5C
W79-00782 5C
W79-00783 5C
W79-00784 5C
W79-00785 5C
W79-00786 5G
W79-00787 5G
W79-00788 5G
W79-00789 5G
W79-00790 5G
W79-00791 6B
W79-00792 5G
W79-00793 6E
W79-00794 5C
W79-00795 3B
W79-00796 5B
W79-00797 4A
W79-00798 4A
W79-00799 5C
W79-00800 4A
W79-00801 3A
W79-00802 3F
W79-00803 3C
W79-00804 2I
W79-00805 4A
W79-00806 4A
W79-00807 3B
W79-00808 5C
W79-00809 5C
W79-00810 3C
W79-00811 6E
W79-00812 3C

W79-00813	2A
W79-00814	3F
W79-00815	4A
W79-00816	2B
W79-00817	5G
W79-00818	4A
W79-00819	6G
W79-00820	5F
W79-00821	5F
W79-00822	4A
W79-00823	5F
W79-00824	5F
W79-00825	5D
W79-00826	3A
W79-00827	7B
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W79-00837	5D
W79-00838	5D
W79-00839	5D
W79-00840	5D
W79-00841	5D
W79-00842	5D
W79-00843	5D
W79-00844	3F
W79-00845	3F
W79-00846	3A
W79-00847	5D
W79-00848	2L
W79-00849	2H
W79-00850	5D
W79-00851	5F
W79-00852	5F
W79-00853	5D
W79-00854	6B
W79-00855	3B
W79-00856	2E
W79-00857	3F
W79-00858	5D
W79-00859	5G
W79-00860	5B
W79-00861	3F
W79-00862	5D
W79-00863	5G
W79-00864	1A
W79-00865	5A
W79-00866	1A
W79-00867	5A
W79-00868	5F
W79-00869	5F
W79-00870	5G
W79-00871	2K
W79-00872	6B
W79-00873	6B
W79-00874	2H
W79-00875	3A
W79-00876	5B
W79-00877	5G
W79-00878	5C
W79-00879	5A
W79-00880	5A
W79-00881	5B
W79-00882	5D
W79-00883	9D
W79-00884	5C
W79-00885	5B
W79-00886	5B
W79-00887	5B
W79-00888	2L
W79-00889	5G
W79-00890	5G
W79-00891	5C
W79-00892	5C
W79-00893	2H
W79-00894	5C
W79-00895	6G
W79-00896	6G
W79-00897	6G
W79-00898	4C
W79-00899	5B
W79-00900	2G
W79-00901	5A
W79-00902	4C
W79-00903	5C
W79-00904	3A
W79-00905	5D
W79-00906	4C
W79-00907	3A
W79-00908	6B
W79-00909	5C
W79-00910	2K
W79-00911	6B
W79-00912	6C
W79-00913	6B
W79-00914	5C
W79-00915	5C
W79-00916	5C
W79-00917	5C
W79-00918	5C
W79-00919	4A
W79-00920	4A
W79-00921	4A
W79-00922	4A
W79-00923	4A
W79-00924	4A
W79-00925	4A
W79-00926	4A
W79-00927	6E
W79-00928	5G
W79-00929	5C
W79-00930	5B
W79-00931	5B
W79-00932	2L
W79-00933	5B
W79-00934	5B
W79-00935	5B
W79-00936	5C
W79-00937	5B
W79-00938	5C
W79-00939	5A
W79-00940	2I
W79-00941	5C
W79-00942	5C
W79-00943	7B
W79-00944	5C
W79-00945	5C
W79-00946	5A
W79-00947	5C
W79-00948	5B
W79-00949	7B
W79-00950	5G
W79-00951	5B
W79-00952	5C
W79-00953	5B
W79-00954	5B
W79-00955	5C
W79-00956	5C
W79-00957	5C
W79-00958	5C
W79-00959	5C
W79-00960	5C
W79-00961	5C
W79-00962	5C
W79-00963	5C
W79-00964	5C
W79-00965	5C
W79-00966	5C
W79-00967	5C
W79-00968	5C
W79-00969	5C
W79-00970	5B
W79-00971	5C
W79-00972	5C
W79-00973	5C
W79-00974	5C
W79-00975	5C
W79-00976	5C
W79-00977	5C
W79-00978	5B
W79-00979	5C
W79-00980	5C
W79-00981	5A
W79-00982	5B
W79-00983	5G
W79-00984	5C
W79-00985	5C
W79-00986	5C
W79-00987	5C
W79-00988	2L
W79-00989	2K
W79-00990	5C
W79-00991	5A
W79-00992	5B
W79-00993	5B
W79-00994	2B
W79-00995	5G
W79-00996	2L
W79-00997	2L
W79-00998	6G
W79-00999	6G
W79-01000	3B

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W79-00914	1
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-00727--00729 00731	4
Illinois State Water Survey, Hydrology	W79-00685--00717	33
University of Arizona, Arid Land Water Resources	W79-00795 00797--00798 00800--00803 00805--00807 00810--00819	20
University of Florida, Eastern U. S. Water Law	W79-00599--00605 00607--00608 00613--00619	16
University of North Carolina, Metropolitan Water Resources Planning and Management	W79-00645--00654 00656--00658 00660--00661 00663--00667 00669--00677 00875	30
University of Wisconsin, Eutrophication	W79-00551--00557 00559--00576 00578--00579 00581, 00595 00768--00787	49
University of Wisconsin, Water Resources Economics	W79-00582--00584 00586--00589 00596--00598 00788--00793	16

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-00523--00528 00530--00535 00678--00684 00854--00874 00898--00901 00908--00913 00919--00926	58
C. OTHER		
Army Engineer Waterways Experiment Station	W79-00536--00550 00750--00767	33
BioSciences Information Service	W79-00515--00520 00529, 00558 00577, 00580 00585, 00606 00609--00612 00633, 00655 00659, 00662 00668, 00718 00726, 00732 00734--00738 00748, 00794 00796, 00799 00804 00808--00809 00848--00849 00884 00889--00891 00893, 00973 00985--00986 00991	47
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-00915--00918 00937--00972 00974--00983	50
Information Planning Associates, Inc.	W79-00501--00514 00876--00883 00902--00907	28
National Oceanic and Atmospheric Administration	W79-00885--00888 00892 00894--00897 00927--00936 00992--00999	27

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
Ocean Engineering Information Service (Patents)	W79-00820--00847 00850--00853	32
Ocean Engineering Information Service (Outer Continental Shelf)	W79-00719--00725 00730, 00733 00739--00747 00749	19
Office of Water Research and Technology	W79-00521--00522 01000	3
U. S. Geological Survey	W79-00620--00632 00634--00644	24
University of Massachusetts (Wetlands)	W79-00984 00987--00990	5

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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A03	4 50	E03	6 25	T03	175 00
A04	5 25	E04	7 50	T04	250 00
A05	6 00	E05	9 00	T05	300 00
A06	6 50	E06	10 50	T06	350 00
A07	7 25	E07	12 50	T07	400 00
A08	8 00	E08	15 00	T08	450 00
A09	9 00	E09	17 50	T09	500 00
A10	9 25	E10	20 00	T10	550 00
A11	9 50	E11	22 50	T11	600 00
A12	10 75	E12	25 00	T12	650 00
A13	11 00	E13	28 00	T13	675 00
A14	11 75	E14	31 00	T14	750 00
A15	12 00	E15	34 00	T15	800 00
A16	12 50	E16	37 00	T16	850 00
A17	13 00	E17	40 00	T17	900 00
A18	13 25	E18	45 00	T18	950 00
A19	14 00	E19	50 00	T19	1 000 00
A20	14 50	E20	60 00	T99	*
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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 3
FEBRUARY 1, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 3
FEBRUARY 1, 1979

W79-01001 -- W79-01500

e Secretary of the U.S. Department of the Interior has de-
mined that the publication of the periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THE DENSITY OF SEAWATER SOLUTIONS AT ONE ATMOSPHERE AS A FUNCTION OF TEMPERATURE AND SALINITY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2K.
W79-01064

2. WATER CYCLE

2A. General

SOME OBSERVED STATISTICAL PROPERTIES OF SMALL SCALE TURBULENCE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W79-01055

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
Operational Hydrology Report No. 7, WMO-No. 429, 1975. 195 p, 119 fig, 21 tab, 13 append.

The WMO project on the intercomparison of conceptual models used in operational hydrological forecasting was reported. The project involved the testing of 10 operational conceptual hydrological models submitted by 7 countries on 6 standard river catchment data sets from climatologically and geographically varied conditions in 6 countries. Each data set consisted of 2 distinct periods: a calibration period (6 years), and a verification period (2 years) which immediately followed after. For each data set, the model owners were supplied with the necessary concurrent observed input data (precipitation, evaporation, and other meteorological data) and observed output data (streamflow) for the 6-year calibration period, and only observed input data for the two-year verification period. For each data set, the model owners used the concurrent observed input and output data for the 6-year calibration period to calibrate and to develop the parameters of their models and employed the additional 2 years of observed input data in the verification period to produce a simulated discharge (computed output). The simulated discharges produced by the tested models for both the calibration and verification periods in each data set then were evaluated centrally and compared by WMO using several graphical and numerical verification criteria. On the basis of this evaluation and intercomparison, several conclusions and recommendations were made concerning the performance and use of the models in various forecasting situations. (See also W76-016633) (Sims-ISWS)
W79-01062

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W79-01426

2B. Precipitation

ACOUSTIC DOPPLER SOUNDING OF FALLING SNOW,
Toronto Univ. (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W79-01034

CORRELATIONS BETWEEN MAXIMUM RATE OF PRECIPITATION AND MESOSCALE PARAMETERS,
Quebec Univ., Montreal. Dept. of Physics.
I. I. Zawadzki, and C. U. Ro.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1327-1334, September 1978. 8 fig, 9 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Correlation analysis, Rain gages, Radar, Rain, Rates, Distribution patterns, Sounding, Energy, Humidity, Cloud physics, Analytical techniques, Weather, Meteorology, Meteorological parameters, Maximum precipitation rates.

Daily 5, 10, and 30 min maxima of precipitation rate determined from a rain-gage network and radar were correlated with parcel convective energies, upper air humidity, height of parcel convection, and maxima of surface conditions. After a selection of 54 well-documented cases, the correlation coefficient between the maximum of rain rate over 5 min and the maximum convective energy was 0.79 for all cases, and 0.89 for 15 air mass cases. Introducing the upper air humidity further improved the correlations. (Sims-ISWS)
W79-01036

THE RELATIONSHIP BETWEEN RADAR REFLECTIVITY FACTOR AND HAIL AT THE GROUND FOR NORTHEAST COLORADO THUNDERSTORMS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 7B.
W79-01037

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01038

GEOCHEMICAL IMPLICATIONS OF SUMMER MONSONNAL RAINWATER COMPOSITION OVER INDIA,
Bhabha Atomic Research Center, Bombay (India). Div. of Radiological Protection.
For primary bibliographic entry see Field 2K.
W79-01039

PREDICTION OF CONVECTIVE ACTIVITY USING A SYSTEM OF PARASITIC-NESTED NUMERICAL MODELS,
Drexel Univ., Philadelphia, PA. Dept. of Physics and Atmospheric Sciences.
D. J. Perkey.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16503, Price codes: A08 in paper copy, A01 in microfiche. NASA Contractor Report CR-2761, December 1976. 159 p, 33 fig, 1 tab, 74 ref, 1 append. NASA NAS8-31235, NSF GA-35093, ERDA E(11-1)-2360, AFCRL AF 19628-69-C-0092.

Descriptors: *Precipitation(Atmospheric), *Weather forecasting, *Model studies, Cloud physics, Mathematical models, Equations, Humidity, Moisture content, Temperature, Convection, Clouds, Rain, Rainfall, Forecasting, Weather, Meteorology, Forecasting models.

A limited-area, three-dimensional, moist, primitive equation (PE) model was developed to test the sensitivity of quantitative precipitation forecasts to the initial relative humidity distribution. Special emphasis was placed on the squall-line region. To accomplish the desired goal, it was necessary to develop time-dependent lateral boundaries and a general convective parameterization scheme suitable for mid-latitude systems. The sequential plume convective parameterization scheme presented was designed to have the versatility necessary in mid-latitudes and to be applicable for short-range forecasts. The results indicated that the scheme is able to function in the frontally forced squall-line region, in the gently rising altostratus region ahead of the approaching low center, and in the overriding region ahead of the warm front. (Sims-ISWS)
W79-01056

HEAT AND THRUST REQUIREMENTS OF A THERMAL FOG DISPERSAL SYSTEM,
Air Force Geophysics Lab., Hanscom AFB, MA.
For primary bibliographic entry see Field 3B.
W79-01058

STOCHASTIC MODELING OF MONTHLY AND DAILY RAINFALL SEQUENCES,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
S. Selvalingam, and M. Miura.
Water Resources Bulletin, Vol. 14, No. 5, p 1105-1120, October 1978. 3 fig, 4 tab, 22 ref.

Descriptors: *Stochastic processes, *Rainfall, *Statistical models, *Probability, Model studies, Monthly, Synthetic hydrology, Rainfall disposition, Persistence, *Thailand, *Thomas-Fiering model, *Quae Yai River(Thailand), Wet spells, Transition probability.

A monthly model and two daly models were presented for the purpose of generating monthly and daily rainfall sequences in the Quae Yai river basin in Thailand. Performance of the models was evaluated by comparing the statistical parameters of the generated sequences with those from historical data. For generating monthly rainfall, the Thomas-Fiering model with gamma-distributed random variable was used. Daily model I, which assumed no persistence between daily rainfall amounts within the wet spells, could not preserve some important parameters regardless of the simplicity in model construction. Application of multi-state transition probability matrix gave good results, although the user must modify some parameters looking at the performance of the model for each historical record. (Singh-ISWS)
W79-01244

CHARACTERISTICS OF RAINFALL CONDITIONS WITH PARTICULAR REFERENCE TO NORTH EAST ENGLAND,
Northumbrian Water Authority, Gosforth (England).
P. S. Kelway.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4, p 251-268, 284, July 1977. 9 fig, 7 tab, 1 ref.

Descriptors: *Rainfal, *Hydrographs, *Runoff, *Rainfall disposition, Distribution patterns, Storm runoff, Floods, Storms, Watersheds(Basins), Annual, Model studies, Duration curves, Peak discharge, Foreign countries, Foreign research, Flood recurrence intervals, Data collections, *Great Britain.

Rainfall conditions affect a large number of the functions of a water authority; and, in many cases, the exact nature of the distribution in time and space is not of major importance. However, in the broad field of what can be classified conveniently as 'operations,' a good knowledge of the distribution and degree of variability of rainfall is of fundamental importance to effective management. Few large-scale problems occur in the Northumbrian Water Authority's (NWA) sphere of activity unless rainfall persists long enough to give totals of at least 30 mm as an average fall over a catchment in a duration of less than 24 hours. As a preliminary means of investigating rainfall types over the NWA area, it was decided to select all storm conditions which gave 50 mm for at least one point in 24 hours or less. In a 30-year period this yielded

55 storms for analysis. Although there was little correlation between rainfall pattern and snyoptic type, there was very good seasonal cohesion for many groups. Flood events produced by relatively minor rainfall amounts, i.e, falls not exceeding 50 mm at any point, show a greater predominance in the winter half-year. This is not surprising as the generally wetter ground then will produce a larger number of flood events from the lighter rainfall. The necessary gauge density for an operational network will depend on the rainfall distribution patterns which are likely. For a realistic study of cost-effectiveness, the anticipated rainfall conditions under which the network is to operate must be studied. The study of meteorological conditions and their effect on rainfall patterns in time and space promises to help the water industry in a number of roles. Much has yet to be done to equate the requirements of the engineer to broadly-based but meaningful information. (Humphreys-ISWS)
W79-01247

GENERATION OF DAILY PRECIPITATION OVER AN AREA,
Agricultural Research Service, Temple, TX.
C. Richardson.
Water Resources Bulletin, Vol. 14, No. 5, p 1035-1047, October 1978. 5 fig, 4 tab, 9 ref.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Daily hydrographs, Stochastic processes, Areal, Fourier analysis, Atmospheric physics, Probability, Probable maximum precipitation, Mathematical studies, *Stochastic structure, Multivariate normal distribution, Generation, Areal precipitation, Periodic.

A model was developed of the periodic-stochastic structure of daily precipitation over an area. The model was based on a multi-variate normal distribution. The square roots of daily precipitation at a point were found to approximate a sample from a uni-variate normal distribution that had been truncated at zero. The zero daily precipitation amounts were considered negative amounts of unknown quantity. The multivariate normal distribution was used to describe the variation of daily precipitation over an area. The periodic fluctuations of the model parameters were described with Fourier series. The model was tested using data from two areas of different precipitation characteristics. Data generated with the model contained many of the statistical characteristics observed in the historical data. (Roberts-ISWS)
W79-01261

TIME AVERAGED AREAL MEAN OF PRECIPITATION: ESTIMATION AND NETWORK DESIGN,
Puerto Rico Univ., Mayaguez.
R. L. Bras, and R. Colon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 938, Price codes: A04 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute Completion Report, February 1977. 44 p, 14 fig, 10 tab, 7 ref. OWRT-A-050-PR(1).

Descriptors: *Network design, *Rainfall, *Data collections, *Precipitation(Atmospheric), *Mathematical studies, Statistical analysis, Hydrology, Statistics, Estimating equations, Equations, Areal mean of precipitation, Time-averaged areal mean.

A methodology for designing and analyzing data collection networks with the goal of obtaining the best estimate of time averaged areal mean of precipitation was presented. This involved using a state augmentation procedure and multivariate linear estimate concepts, in particular, the Kalman-Bucy filter. The resulting technique can be used to analyze existing data networks, design new networks, and process data from existing networks. The procedure can handle any network configuration, and explicitly accounts for the number of stations, their particular location, the duration of observations, and the measurement errors. Advantages of the procedure are generality, and the fact that it explicitly acknowledges an unknown mean for the process and allows introduction of prior information. (Majtenyi-IPA)
W79-01357

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
For primary bibliographic entry see Field 5A.
W79-01474

2C. Snow, Ice, and Frost

ACOUSTIC DOPPLER SOUNDING OF FALLING SNOW,
Toronto Univ. (Ontario). Dept. of Physics.
H. Melling, and R. List.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1267-1273, September 1978. 7 fig, 3 tab, 18 ref.

Descriptors: *Remote sensing, *Snow, *Acoustics, *Sound waves, Snowfall, Radar, On-site investigations, Data processing, Sounds, Sounding, Precipitation(Atmospheric), Weather, Meteoroiogy, Doppler sounding, Acoustic sounding.

Acoustic echoes received during snowfall were investigated using a vertically directed echo sounder. Doppler shift analysis of the echoes indicated consistent downward motion in the range 1-2 m/s, and thus demonstrated that the snowflakes are the cause of the observed backscattering. Consideration of the mean scattered power yielded a radar reflectivity for the snow of 35-42 dBZ and a precipitation rate of 1.2-2.7 mm/h. The latter figure may be compared with the actual mean precipitation rate of 0.9 mm/h averaged over the duration of the showers and over intervening periods of little or no snow. The observed probability distribution of instantaneous echo power was log-normal. This is in contrast to the theoretically predicted exponential function. The standard deviation of the log-normal distribution is close to 6.1 dB, which is the saturation value expected for acoustic waves interacting strongly with the turbulent atmosphere. Thus, multiple scattering may be significant in these observations, and also generally in atmospheric echo sounding. (Sims-ISWS)
W79-01034

RANDOMIZED CLOUD SEEDING IN THE SAN JUAN MOUNTAINS, COLORADO,
Aerometric Research Inc., Goleta, CA.
For primary bibliographic entry see Field 3B.
W79-01035

THE RELATIONSHIP BETWEEN RADAR REFLECTIVITY FACTOR AND HAIL AT THE GROUND FOR NORTHEAST COLORADO THUNDERSTORMS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 7B.
W79-01037

APPROXIMATE CALCULATION OF NONSTATIONARY TEMPERATURE REGIME OF A ROCK-ICE DAM.
For primary bibliographic entry see Field 8D.
W79-01049

ORGANIZATION OF FULL-SCALE ANALYSES OF FILTRATION-THERMAL REGIME OF TAILINGS DAMS ON PERMAFROST FOUNDATIONS,
For primary bibliographic entry see Field 8D.
W79-01050

TAILINGS COFFERDAMS ON PERMAFROST FOUNDATIONS IN YAKUTSKAYA ASSR,
For primary bibliographic entry see Field 8D.
W79-01051

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 3B.
W79-01063

MICROWAVE REMOTE SENSING OF SEA ICE IN THE AIDJEX MAIN EXPERIMENT,
Geological Survey, Tacoma, WA. Water Resources Div.; and Department of the Environment, Ottawa(Ontario).
W. J. Campbell, J. Wayenberg, J. B. Ramseyer, R. O. Ramseier, and M. R. Vant.
Boundary-Layer Meteorology 13, D. Reidel Publishing Company, Dordrecht, Holland, p 309-337, 1978. 19 fig, 2 tab, 41 ref.

Descriptors: *Remote sensing, *Sea ice, *Infrared radiation, *Microwaves, *Arctic, Aircraft, On-site data collections, Ice-water interfaces, Ice cover, Analytical techniques, Evaluation, *Beaufort Sea, *Sea-ice types.

During the Arctic Ice Dynamics Joint Experiment (AIDJEX), April 1975 through May 1976, a comprehensive microwave sensing program was performed on the sea ice of the Beaufort Sea. Surface and aircraft measurements were obtained during all seasons using a wide variety of active and passive microwave sensors. The surface program obtained passive microwave measurements of various ice types using four antennas mounted on a tracked vehicle. In three test regions, each with an area of approximately 15 thousand sq mi, detailed ice crystallographic, dielectric properties, and brightness temperatures of first-year, multiyear, and first-year/multiyear mixtures were measured. A NASA aircraft obtained passive microwave measurements of the entire area of AIDJEX manned station array (triangle) during each of 18 flights. This verified the earlier reported ability to distinguish first-year and multiyear ice types and concentration and gave new information on ways to observe ice mixtures and thin ice types. The active microwave measurements from aircraft included those from an X- and L-band radar and from a scatterometer. The former is used to study a wide variety of ice features and to estimate deformations, while both are equally usable to observe ice types. With the present data only the scatterometer can be used to distinguish positively multiyear ice from first-year ice and various types of thin ice. This is best done using coupled active and passive microwave sensing. (Woodard-USGS).
W79-01386

2D. Evaporation and Transpiration

AN ENERGY BUDGET ANALYSIS OF EVAPOTRANSPIRATION FROM SALTCEDAR,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W79-01231

ANNUAL CATCHMENT LOSSES-A PRACTICAL METHOD,
Welsh National Water Development Authority, Cardiff.
W. L. Jack.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4, p 280-284, July 1977. 1 fig, 2 tab, 9 ref.

Descriptors: *Watersheds(Basins), *Evapotranspiration, *Water loss, *Estimating, Annual, Analytica techniques, Weathering, Elevation, Forests, Data collections, Foreign countries, Foreign research, Evaporation, *Wales.

The need for estimates of annual catchment losses in water resources work has been appreciated for a long time, but very few guidelines are available to hydrologists. The lack of published information reflects the difficulty of obtaining accurate data on which to base such guidelines. This paper related

evapotranspiration losses to elevation, exposure, and afforestation for Welsh catchments and gave examples of the range of losses found. For using the methods in other parts of Britain, three additional adjustments were suggested. Actual evapotranspiration for a catchment is dependent on many variables, including soil cover, type of vegetation, slope, aspect, elevation, cloud cover, temperature, humidity, etc. The three parameters, vegetation, soil cover, and radiation input, were considered to be the primary variables within the Welsh National Water Development Authority area. These three parameters are not at all easy to measure, but they relate to another three parameters which were finally selected, namely elevation of the catchment, exposure of the catchment and degree of afforestation. The catchment losses derived by the technique described are average annual losses. (Humphreys-ISWS)
W79-01248

2E. Streamflow and Runoff

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
J. E. Costa.
Geology, Vol. 6, No. 10, p 617-620, October 1978. 5 fig, 24 ref.

Descriptors: *Flash floods, *Flood recurrence interval, *Colorado, *Geologic investigations, Disasters, Floods, Flood discharge, Stratigraphy, Geological surveys, On-site investigations, Dating, *Big Thompson River(Colorado).

Conventional engineering hydrologic analysis of the 1976 Colorado centennial Big Thompson flood indicates that the flood event, while castrophic, was not extremely unusual. The geologic evidence in the area immediately below the area of maximum runoff, however, indicates that a flood of this magnitude had not occurred in the main channel for several thousand years. Alluvial-fan deposits extensively eroded by the flood waters were dated by observations of hue oxidation, coring of trees, and 14C dating of buried charcoal. Some eroded deposits were as old as 7,000 to 10,000 14C yr. Where usable, geologic evaluations of extreme flood events may yield more accurate estimates of the risk of large, rare floods than conventional methods. (Humphreys-ISWS)
W79-01047

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
S. W. Huntington.
PhD Dissertation, April 1974. 234 p, 93 fig, 65 ref, 4 append.

Descriptors: *Urbanization, *Floods, *Model studies, Mathematical models, Hydraulic models, Instrumentation, Photography, On-site investigations, On-site data collections, Watersheds(Basins), Runoff, Streamflow, Rivers, Flood plains, Flood control, Waves(Water), Flood waves, Flood routing, Wave pile-up, Cities, Hydraulics, Hydrology.

Urbanization of an area susceptible to flooding usually aggravates considerably the problem of flooding. Two major constituent factors are apparent: namely, accentuation of the flood wave due to increased rates of flow from sewer systems, and reduction of the natural storage potential of a channel system following development on flood plains. Such problems are envisaged subsequent to the urbanization of parts of North Gloucestershire, upon which area attention in this study was focussed. However, data collected from this and other areas suggest that the problems of the study area are typical, and as such, the findings of this research have a wider relevance. This particular study investigated the problems associated with the effects of modifying the flood plains in a channel system which is expectd to carry an accentuated hydrograph. Both physical and numerical model studies were carried out in order to study the effectiveness of flood plains in controlling flood levels. The physical model was used to examine the basic mechanics of the problem, and the numerical model was employed to compile these results to real rivers. The results from the physical model indicated in a qualitative manner the performance of various geometries of flood plain and the effect of downstream controls. On the basis of available data, the numerical model was shown to simulte the physical model results sufficiently well to justify application of the basic techniques to flood wave propagation in real rivers. (Sims-ISWS)
W79-01060

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2A.
W79-01062

FLOOD PLAIN INUNDATION CAUSED BY DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W79-01265

FLOODS FROM BREACHING OF DAMS,
Nunn, Snyder and Associates, Fairfax, VA.
For primary bibliographic entry see Field 8B.
W79-01267

UNSTEADY FLOW MODELING OF DAM-BREAK WAVES,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 8B.
W79-01268

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W79-01269

COMPARATIVE ANALYSIS OF ROUTING TECHNIQUES FOR THE FLOODWAVE FROM A RUPTURED DAM,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01272

A NUMERICAL MODEL FOR MULTIDIMENSIONAL UNCONSTRAINED FLOW OVER IRREGULAR TERRAIN,
Energy Inc. Idaho Falls, ID.
For primary bibliographic entry see Field 8B.
W79-01275

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 8B.
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 8B.
W79-01278

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE ROCK-FOX RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
B. K. Holmstrom.
Water-Resources Investigations 78-85 (open-file report), August 1978. 98 p, 6 fig, 2 plates, 3 tab, 15 ref.

Descriptors: *Low flow, *Streamflow, *Regression analysis, *Equations, Analytical techniques, Flow duration, Low-flow frequency, Wisconsin, *Rock-Fox River basin.

Low-flow characteristics of streams in the Rock-Fox River basin, Wis., include estimates of low-flow frequency ad flow duration at 13 gaging stations; low-flow frequency characteristics at 32 low-flow partial-record stations and 78 miscellaneous sites; and a list of base-flow discharge measurements at 244 miscellaneous sites. Equations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is availabe. The equations were determined from multiple-regression analyses that related low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the aveage of once in 2 years and once in 10 years. Standard error provides the user with the expected degree of accuracy for each method. (Woodard-USGS).
W79-01366

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01368

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01380

2F. Groundwater

CALCIFICATION AND ITS ROLE AMONG THE MACROALGAE,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 2I.
W79-01097

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
P. G. Chamberlain.
Mining Congress Journal, Vol. 64, No. 9, p 22-25, September, 1978. 5 fig, 5 ref.

Descriptors: *Permeability, *Leaching, *Mining engineering, Pumping tests, Pressure head, Wells, Drilling.

Field permeability techniques were surveyed to determine which ones could be used by mine operators to evaluate formations for potential leachability. Relevent methods were described in a 'cookbook' (Field Permeability Test Methods with Applications to Solution Mining) which included detailed test procedures, analysis techniques and required equipment. The most suitable tests, constant-head, variable-head and pumping tests, are

performed by injecting or withdrawing water from wells drilled onto the formation. Pumping tests employ two or more observation wells and provide more accurate estimates of the fluid flow conditions during leaching operations than do other tests. Where cost and ease of operation are more important than extreme accuracy, constant-heat and /or variable-head tests should be used. It is important that testing wells be drilled with minimal formation contamination to minimize plugging of the permeability channels. Once a suitable well has been drilled, essential testing procedures are: (1) injecting (or withdrawing) water; (2) measuring this water; (3) measuring the pressure (or head) in the test zone; and (4) measuring time. Equipment can range from water bucket and tape measures to sophisticated instrument packages. Certain tests require special equipment and it may be desirable to run more than one test to verify results. (Purdin-NWWA)
W79-01111

REGIONAL GEOLOGY SERIES: PART X,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 83-84, November, 1978. 1 fig.

Descriptors: *Ground water, *Regional analysis, *Geology, *Drilling, Aquifers, Glacial drift, Sedimentary rocks, Water quality, Underground storage.

The Glaciated Central Region is characterized by a thick mantle of glacial drift overlying consolidated rocks. The sand and gravel deposits in this region act as prolific ground water reservoirs for municipal, domestic and agricultural wells, help recharge deeper aquifers, and sustain base flow of streams. Sedimentary formations, especially sandstones, form the region's major ground water reservoir. Increased withdrawal of ground water in several major cities has caused a gradual decline in artesian pressure in the sandstone. The region's limestones are only moderately productive but are important water sources in some areas. Fill may contain deposits of sand or sand and gravel with reliable yields. Permeable valley train deposits of pre-glacial river beds may be excellent ground water reservoirs or storage reservoirs for cooling water. Drillers in the Glaciated Central Region use cable tool, mud rotary, reverse rotary, augering and jetting methods. Drilling problems are minimal with occasional caving sands and boulder fields. Water quality is generally good. Hardness, high iron concentrations and hydrogen sulfide are reported in some glacial drift, deep limestone, and shales. (Purdin-NWWA)
W79-01115

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-01213

PARAMETER IDENTIFICATION IN AN INHOMOGENEOUS MEDIUM WITH FINITE ELEMENT METHOD,
California Univ., Los Angeles. Dept. of Engineering Systems.
Y. S. Yoon, and W. W-G. Yeh.
Society of Petroleum Engineers of AIME, Dallas, Texas Paper Number SPE 5524 October, 1975. 12 p, 3 fig, 2 tab, 20 ref. (California Water Resources Center Project UCAL-WRC-W-290).

Descriptors: *Mathematical models, *Algorithms, *Parametric hydrology, Unsteady flow, Least squares method, Model studies, Porous media, *Finite element analysis, Aquifers.

An efficient algorithm is developed for parameter identification in a nonlinear partial differential equation of parabolic type associated with a two-dimensional unsteady fluid flow through a porous medium. The parameter chosen for identification is the hydraulic conductivity which is a function of space variables. Finite elements are used to represent the unknown function parametrically in terms of nodal values over a suitable discretization of the space variables. These nodal values are then determined by the least-squares fitting between the observed and calculated flow potentials, subject to linear inequality constraints imposed upon the parameters to be identified. To handle such constraints, Rosen's gradient projection technique is combined with the Gauss-Newton method. Efficient numerical procedures are presented for the solution of the partial differential equation using the Galerkin method and a predictor-corrector approach. (Snyder-Calif, Davis)
W79-01341

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA. Water Resources Div.
J. F. Poland.
Water Spectrum, p 11-16, Spring 1978. 7 fig.

Descriptors: *Land subsidence, *Groundwater, *Overdraft, *Aquifers, *Hydrogeology, Saline water intrusion, Flood damage, Engineering structures, Levees, Flood control, Groundwater recharge, Reparing, Well casings, Roads, Bridges, Railroads, Costs, Evaluation, *California, *Santa Clara Valley(Calif), *San Francisco Bay area(Calif).

The Santa Clara Valley in California is a long, narrow structural through that extends about 90 miles southeast from San Francisco, with the bay occupying much of its northern third. This article focuses on the densely populated central third of the valley. Most of this central area experienced one to eight feet of subsidence from 1934 to 1967 caused by groundwater overdraft. Lands adjacent to San Francisco Bay have sunk two to eight feet since 1912, requiring construction and raising of levees to restrain landward movement of the saline bay water onto 17 square miles of land now below high-tied level. Also, flood-control levees have beeen built and maintained near the bayward ends of the depressed stream channels. by 1974 about $9 million had been spent for flood-control levees on the streams entering the bay to correct for subsidence effects. The cost of repair or replacement of damaged wells reportedly has been $4 million. Including funds spent on maintaining the salt-pond levees, establishing and relieving the bench-mark network, repairing railroads, roads, and bridges, and making private engineering surveys, the gross costs of subsidence are in the range of $15-20 million to date. (Woodard-USGS)
W79-01365

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01367

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

DIGITAL-MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER, OTTER CREEK-DRY CREEK BASIN, CORTLAND COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
O. J. Cosner, and J. F. Harsh.
Water-Resources Investigations 78-71 (open-file report), 1978. 34 p, 12 fig, 4 tab, 19 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Water table, *Computer models, *Surface-groundwater relationships, Glacial aquifers, Groundwater movement, Withdrawal, Groundwater recharge, Leakage, Seepage, Digital computers, Analytical techniques, *New York, Cortland County(NY), *Otter Creek-Dry Creek basin(NY), Simulation analysis.

The city of Cortland, New York, and surrounding areas obtain water from the highly productive glacial-outwash aquifer underlying the Otter Creek-Dry Creek basin. Pumpage from the aquifer in 1976 was approximately 6.3 million gallons per day and is expected to increase as a result of population growth and urbanization. A digital ground-water model that uses a finite-difference approximation technique to solve partial differential equations of flow through a porous medium was used to simulate the movement of water within the aquifer. The model was calibrated to equilibrium conditions by comparing water levels measured in the aquifer in March 1976 with those computed by the model. Then, from the simulated water-level surface for March, a transient-condition run was made to simulate the surface as measured in September 1976. Computed water levels presented as contours are generally in close agreement with potentiometric-surface maps prepared from field measurements of March and September 1976. (Woodard-USGS)
W79-01377

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
C. A. Harr, L. C. Trotta, and R. G. Borman.
Wisconsin Geological and Natural History Survey Madison, Information Circular No 37, 1978. 30 p, 16 fig, 1 plate, 24 ref.

Descriptors: *Groundwater resources, *Geology, *Hydrogeology, *Aquifer characteristics, *Water quality, Groundwater availability, Pumping, Water yield, Groundwater recharge, Groundwater movement, Water utilization, Wisconsin, *Columbia County.

Columbia County, Wisconsin, is underlain by two major aquifers; the sandstone and sand-and-gravel aquifers. Fifteen gallons per minute (gpm) can be obtained from wells almost anywhere in the county. Yields of more than 1,000 gpm are available from the sand-and-gravel aquifer where the saturated thickness is sufficient. The sandstone aquifer underlies most of the county and is more than 700 feet thick in the south-central part. It is capable of yielding more than 1,000 gpm in about three-fourths of the county and is the principal source of municipal water supplies. The chemical quality of water from the two aquifers is similar. It is very hard, and much of it contains excessive amounts of iron and manganese. Concentrations of dissolved solids and chloride are highest in areas underlain by bedrock of Ordovician age. About 5.0 million gallons per day of water was pumped in 1974, of which 90 percent was from the Sandstone aquifer. About 45 percent of the water was for industrial and commercial purposes, 37 percent was for residential use, 16 percent for municipal use, and 2 percent for irrigation. (Woodard-USGS)
W79-01384

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
C. T. Rightmire.
Water Resources Research, Vol 14, No 4, p 691-692 Aug 1978 1 fig 9 ref.

Descriptors: *Geochemistry, *Groundwater recharge, *Soil gases, *Carbon dioxide, *Stable isotopes, Seasonal, Fluctuations, Sampling, Analytical techniques.

Soil carbon dioxide is the dominant source of dissolved inorganic carbon in recharging waters. Samples of soil Co2 were collected to determine if seasonal variations in C-13 content parallel those previuosly observed for pc02. Significant seasonal variations in both Pco2 and C-13 content were observed. Studies of groundwater carbonate chemistry require knowledge o the season during which major recharge occurs. (Woodard-USGS)
W79-01387

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
G. M. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 978, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1976. 94 p, 18 fig, 32 ref. OWRT A-047-IND(2).

Descriptors: *Groundwater movement, Groundwater, Tritium, Gas chromatography, *Tracers, *Dating, Aquifers, Texas, New Jersey, Alabama, *Trichlorofluoromethane, *Groundwater age, Hot Springs National Park(Ala), Wheaton Tract(NJ), Edwards Aquifer(Tex).

It was assumed that the amount of trichlorofluoromethane (CCl3F) present in the groundwater would serve as an indicator of the age and movement of such water. Preliminary investigations were conducted in three areas where the hydrology was well understood and where tritium measurements had been made in the past. They were: the Wharton tract in southern New Jersey, Hot Springs National Park, Alabama, and the Edwards aquifer of south central Texas. Good agreement was observed between the CCl3F data and the known hydrology. The Texas study revealed a series of anomalous CCl3F concentrations that were too high to be of atmospheric origin. The anomalous points occurred in a line extending from the northwest corner of San Antonio 46 miles along the Balcones fault zone. The location of the plume indicates direction of ground-water movement in the area and demonstrates the likely utility of CCl3F as a ground-water tracer. All CCl3F measurements were made in the field with a portable gas chromatograph especially designed and built for the purpose. (Wiersma-Purdue)
W79-01422

2G. Water In Soils

A PROBABILISTIC ANALYSIS OF EMBANKMENT STABILITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W79-01054

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W79-01087

RELATION OF WATER ABSORPTION TO DURATION OF APPLICATION IN FURROW IRRIGATION,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 3F.
W79-01094

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
For primary bibliographic entry see Field 7B.
W79-01101

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W79-01127

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01133

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01237

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 4A.
W79-01257

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01282

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01283

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01299

INTERRELATION BETWEEN INSECT LARVAE AND SOIL MICROFLORA IN FOREST BOGS,
L. S. Kozlovskaya, and L. M. Zagural'skaya.
In: Interrelation of Forest and Bog, p 88-97, 1967. 5 tab, 15 ref. Translated from Russian.

Descriptors: *Bogs, *Larvae, *Microorganisms, *Soil formation, Wetlands, Insects, Larval growth stage, Bacteria, Soil environment, USSR.

Insect larvae play an important role int the soil formation process. They first convert nitrogen into soluble forms which correspond to the composition of the microflora of their intestines. Second, they activate fewer groups of microflora than the Enchytraeids an Lumbricids earthworms. An increase in the number of ammonifying bacteria, including fluorescent bacteria, vegetative forms of spore-forming bacteria, bacteria capable of utilizing mineral nitrogen, and oligonitrophilic bacteria in the intestines was a unique feature of all three insect families, Tipulidae, Sciaridae, and Bibionidae, under study. There was an absence of cellulose-decomposing bacteria in the alimentary tract of the larvae of these insects. There was also a considerable decrease in the number of fungi and spores. The composing of the microflora from larvae excrements points to continuous intensive decomposition processes. The excrement contaned many organisms growing on the mineral nitrogen source; there was a lack of actinomycetes and cellulose-decomposing microorganisms and an increase in spore-farming bacteria. The interrelation with the microflorain controlled by the type of food material and the specific conditions inside the animal intestines. (See also W79-01297) (Steiner-Mass)
W79-01301

GROUP 'B' VITAMINS IN PEAT SOILS AND EXCREMENT OF INVERTEBRATES,
S. R. Dik.
In: Interrelation of Forest and Bog, p 98-104, 1967. 5 tab, 16 ref. Translated from Russian.

Descriptors: *Muck soils, *Vitamin B, *Invertebrates, Wetlands, Bogs, Marshes, Peat, Microorganisms, Soil bacteria, Soil environment, USSR.

A comparison of mineral and marsh soil shows that the vitamin B1 and B2 content in the latter is higher despite the low microflora content. Factors explaining this are: first, an abundance of plant material is present in peat soils during soil decomposition and the vitamins in this material are released into the soil; second, the humidity of the marsh soils during the summer months favors microorganism activity whereas in chernozem soils the steep reduction in water content limits beneficial microflora activity. Especially large amounts of vitamin B2 are found in the excrement of soil invertebrates capable of living in peat soils. Some B2 vitamin is also found in the excrement of earthworms; less in the excrement of Enchytraeids. Generally there is 1.7 times more B2 in the excrement of either animal than in peat soil. This can be explained by the fact that the excrement of soil organisms provides better conditions for the development of microflora, which serve as a source of vitamins in the soil. (See also W79-01297)(Steiner-Mass)
W79-01302

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
L. S. Kozlovskaya.
In: Interrelations of Forest and Bog, p 105-128, 1967. 2 fig, 7 tab, 21 ref. Translated from Russian.

Descriptors: *Muck soils, *Soil bacteria, *Invertebrates, *Larvae, Wetlands, Bogs, Marshes, Peat, Microorganisms, Soil environment, Decomposing organic matter, Annelids, Insects, USSR.

The maximum and minimum of oligochaetes and larvae of two-winged insects coincide with the maximum and minimum numbers of ammonifying bacteria, microorganisms growing on mineral nitrogen, and oligonitrophilic microorganisms. These groups become active in the animal excrement, assimilating the different nitrogen compounds for their energy, and accelerate the organic matter decomposition process. Available nitrogen increases under the influence of ammonifying microorganisms and potassium increases under the influence of cellulose-decomposing microorganisms. (See also W79-01297) (Steiner-Mass)
W79-01303

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W79-01350

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.

For primary bibliographic entry see Field 2F.
W79-01387

2H. Lakes

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01028

CHLORINATED HYDROCARBONS AND MERCURY IN AQUATIC VASCULAR PLANTS OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01029

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01040

SAND TRANSPORT MODEL OF BARCHAN DUNE EQUILIBRIUM,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W79-01043

WIND EFFECTS ON SURFACE TO BOTTOM FRONTS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 2L.
W79-01045

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

QUANTITATIVE AND QUALITATIVE CHANGES IN THE PHYTOPLANKTON OF LAKE KINNERET, ISRAEL, 1972-1975,
Israel Oceanographic and Limnological Research Ltd., Haifa.
For primary bibliographic entry see Field 5C.
W79-01198

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 5C.
W79-01199

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5C.
W79-01202

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
For primary bibliographic entry see Field 5B.
W79-01207

THE OKEFENOKEE SWAMP WATERSHED: WATER BALANCE AND NUTRIENT BUDGETS,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
E. J. Rykiel, Jr.
Okefenokee Ecosystem Investigations, Technical Report No. 3, University of Georgia. Ph.D. Dissertation. January 1978. 246 p, 34 fig, 42 tab, 116 ref, 3 append.

Descriptors: *Swamps, *Georgia, *Nutrient cycling, *Hydrologic budget, Wetlands, Nutrients, Potassium, Calcium, Chlorides, Model studies.

System level nutrient budgets indicate net gains in calcium and potassium and net losses for magnesium, sodium, and chloride for the entire swamp-upland system. Subsystem level nutrient budgets are in general agreement with system level budgets. The uplands show a small net gain of potassium. Net losses are indicated for the other elements. For the swamp subsystem accumulation of calcium and potassium is intensified compared to the systems budgets. The magnesium budget is shifted from a net loss to a net gain. The input of nutrients from the uplands subsystem to the swamp is very important. Potassium is the only element with greater input from precipitation than from uplands. Precipitation supplied about 25% of the calcium, 29% of the magnesium, 68% of sodium, all of the potassium, and 47% of the chloride. Streamflow accounts for both the major water and nutrient output from the watershed. (Steiner-Mass)
W79-01211

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 2K.
W79-01212

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. P. Novitzki.
Water Resources Investigation 78-48. June 1978. 25 p. 7 fig, 3 tab, 14 ref.

Descriptors: *Wetlands, *Wisconsin, *Hydrologic cycle, Water quality, Sediments, Nitrogen, Nutrients, Evapotranspiration, Groundwater movement, Surface runoff.

Groundwater enters the wetlands as springflow and as leakage upward through the organic wetland soils. Inflow was composed of direct precipitation (7%), surface water inflow (4%), and groundwater inflow (89%). Outflow from the wetland was composed of streamflow (92%) and evapotranspiration (8%). Some groundwater flowed beneath the wetland but did not discharge within the study area. Groundwater inflow contained 95% of the nitrogen that entered the wetland, precipitation contained 2%, and surfacewater inflow contained 3%. Sixty-six percent of the phosphorus input was from groundwater, 31% from surface water, and 3% from precipitation. The wetland retained 21% of the nitrogen and 7% of the sediment that entered it. (Steiner-Mass)
W79-01213

RELATIONSHIPS BETWEEN MINERAL SUPPLY AND GROWTH OF NARTHECIUM OSSIFRAGUM (L.) HUDS. ON MIRE ECOSYSTEMS,
Reading Univ. (England). Dept. of Agriculture; and Reading Univ. (England). Dept. of Horticulture.
R. J. Summerfield, and J. O. Rieley.
Journal of Ecology, Vol. 63, No. 2, p 643-656, July, 1975. 9 tab, 24 ref.

Descriptors: *Bogs, *Plant growth, *Regression analyses, *Standing crop, *Wetlands, Nutrients, Marsh plants, Model studies, Mathematical models, Calcium, Phosphate, *Mires, *Narthecium ossifragnum, Valley mire(Great Britain), Mineral ion supply.

Regression models relating the growth of Narthecium ossifragum to both mineral ion supply and uptake are reported. Six attributes of standing crop together with eight mineral ions in the rooting substrate and the plant itself were investigated on four mire sites over a period of one year. The investigation resulted in over 12,000 chemical analyses and 1,300 measurements of standing crop attributes. Using multiple linear regression, it was possible to reduce this data to six equations comprising a total of only 36 variables. All six equations could be interpreted in a meaningful manner and were relevant biologically. The importance of phosphate and calcium supply and uptake, together with the ionic status of the mire water and chemistry of the local precipitation, to the growth of N. ossifragum was clearly demonstrated. (Steiner-Mass)
W79-01216

THE INFLUENCE OF COLLOIDAL ORGANIC MATTER ON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01219

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
For primary bibliographic entry see Field 5C.
W79-01223

NITROGEN AND PHOSPHORUS FERTILIZATION OF AQUATIC VASCULAR PLANTS AND ALGAE IN REPLICATED PONDS. I. INITIAL RESPONSE TO FERTILIZATION,
Lawler, Matusky and Skelly, Tappan, NY; and Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5C.
W79-01224

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W79-01253

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5B.
W79-01258

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 4C.
W79-01260

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye. 1976. P'yavchenko, N. I., Ed. Translated from USDA Forest Service.

Descriptors: *Bogs, *Forests, *Ecology, Wetlands, Peat, Productivity, Dusts, Nitrogen, Aquatic habitats, Invertebrates, *USSR.

This collection, which includes a review of station research on the bog-forest-biogenocenose, contains nine articles. In these the main features of bog formation under existing natural conditions are discussed; a description of the water regime and microclimate of dry and wet bogs is given; and the results of research on the quantity, population, and

interaction of soil invertebrates and microorganisms under the impact of seasonal changes in the chemistry of peat soils are dealt with. An attempt has been made to examine the biological productivity of forest associations on bogs and to stufdy the biologica cycle of nitrogen and other mineral elements. The role of atmospheric dust in metabolism i the bog-forest ecosystem has also been examined. The papers describe changes in the vegetation on newly reclaimed bogs and the process of establishing highly productive forests on long-reclaimed ones. (See W79-01298 thru W79-01305) (Steiner-Mass)
W79-01297

SOME RESULTS OF STATION RESEARCH ON THE INTERRELATION OF FOREST AND BOG IN WESTERN SIBERIA,
N. I. P'yavchenko.
In: Interrelations of Forest and Bog, p 1-39. 5 fig, 16 tab, 44 ref. Translated from Russian.

Descriptors: *Bogs *Drying, *Vegetation establishment, Wetlands, Peat, Dewatering, Forests, Forest management, Vegetation regrowth, Trees, Decomposing organic matter, USSR.

The drying of bogs in south Tomsk region does not bring about any obvious change in the temperature regime of the ground layer of air and the root-feeding zone of the soil that could obstruct the use of dry bogs for afforestation purposes. Lowering the subsoil water level and freeing the soil from excess water immediately improves soil aeration and favors decomposition of organic matter. This occurs as a result not only of the increased activity of soil invertebrates and microbes but also of the dominance of such organisms as accomplish a deeper process of humification and mineralization of organic remains. Reclamation by drying the soil, mainly by changing the water and air regimes, thereby helping the growth and activity of microzoocenoses and intensifying the decomposition of the peat's organic matter, brings about considerable changes in the earlier phytocenoses. The tree growth present before the drying improves; the earlier grass-moss cover degrades and converts into a cover of mesotrophic plants; consequently the open spaces of the bogs become covered with stands of trees. (See also W79-01297) (Steiner-Mass)
W79-01298

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
L. M. Zagural'skaya.
In: Interrelations of Forest and Bog, p 54-80, 1967. 11 tab, 21 ref. Translated from Russian.

Descriptors: *Bogs, *Marshes, *Soil fungi, *Soil bacteria, Wetlands, Peat, Fungi, Aquatic fungi, Microorganisms, Actinomycetes, Myxobacteria, Muck soils, Soil environment, Soil microbiology, Soil microorganisms, Tomsk Region(USSR).

In the marsh peat soils of low-lying and upland conditions, the total number of microorganisms changes from 92 to 7 million per g of absolutely dry peat. Most microbes live in the uppermost layer of the peat reserves (0-10 cm layer). Low-lying bogs are somewhat richer in microflora and the different groups. In respect of plant material decomposition, a leading role is played by bacteria, followed by actinomycetes and then fungi. In the soils of upper bogs, however, fungi follow bacteria in importance. Marsh soils are rich in bacteria growing on ammoniacal starch agar medium. Fluorescent bacteria dominate the group of ammonifying bacteria. Predominant among the spore-forming bacteria are Baccillus cerens in low-lying bogs and Baccillus agglomeratus in upper bogs. There are more bacteria, with luminescent colonies, in the 0-10 cm layer. The drying of marsh soils results in an increase in the quantity of actinomycetes and spore-forming bacteria. Even the mass of myxobacteria and actinomycetes among the aerobic cellulose decomposers increases. (see also W79-01297) (Steiner-Mass)
W79-01299

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
L. M. Zagural'skaya.
In: Interrelation of Forest and Bog, p 81-87, 1967. 3 tab, 8fig. Translated from Russian.

Descriptors: *Bogs, *Decomposing organic matter, Wetlands, Peat, Microogranisms, Detritus, USSR.

In the peat of low-lying bogs, birch leaves completely decompose within one year; mixed grasses, cedar needles, and the sedge follow birch. Sphagnum moss decomposes quite slowly. The maximum loss of dry matter for all the peat-forming plants was noted in the first 40 days; beyond that, decomposition slows down. A high count of microorganisms was observed in mixed grasses during the whole experimental period; birch and sedge leaves followed. The maximum number of microorganisms was recorded two months after beginning the experiments. (See also W79-01297) (Steiner-Mass)
W79-01300

INTERRELATION BETWEEN INSECT LARVAE AND SOIL MICROFLORA IN FOREST BOGS,
For primary bibliographic entry see Field 2G.
W79-01301

GROUP 'B' VITAMINS IN PEAT SOILS AND EXCREMENT OF INVERTEBRATES,
For primary bibliographic entry see Field 2G.
W79-01302

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
For primary bibliographic entry see Field 2G.
W79-01303

THE SHIFT OF BOG VEGETATION UNDER THE INFLUENCE OF DRYING,
G. M. Platonov.
In: Interrelation of Forest and Bog, p 129-140, 1967. 3 fig, 2 tab, 8 ref. Translated from Russian.

Descriptors: *Bogs, *Drainage effects, *Marsh plants, Wetlands, Peat, Dewatering, Drying, Mosses, Canals, Grasses, Amphibious plants, Cranberries, USSR.

Bog drying canals had a marked influence up to 50 m from the banks of the canal, causing small or large changes in the original plant cover. Over a patch 10-20 m wide adjoining the canals, the drying had a particularly pronounced effect. The hydrophilic types of flowering plants and the quagmire bog-sphagnum mosses were among the bog grasses eradicated. On the very dry parts of the sphagnum moss cover completely disappeared. Sedges, bogbean, sabal, and marsh bushes seemed to be more resistant to drying. The less water-loving marsh or mesophilic plants, dominated by lancet reed grass, occupied the space vacated by the other marsh plants. Ivan's tea and thorny fruiting plants from the family Compositae were common on the dry banks of the canals. Among the trees, willows, birch seedlings, and pines appeared on the edge of the canals with the exception of parts with a thick peat cover. Over the very dry surface of the bog the natural afforestation conditions were not favorable in the first year of drying due to the soil being loose and the rapid drying of the upper layer of undecomposed sedge-sphagnum waste. (See also W79-01297) (Steiner-Mass)
W79-01304

ABOUT THE AFFORESTATION OF BOGS IN TOMSK REGION,
S. P. Efremov.
In: Interrelation of Forest and Bog, p 141-173, 1967. 10 fig, 9 tab, 26 ref. Translated from Russian.

Descriptors: *Bogs, *Drying, *Vegetation establishment, Wetlands, Peat, Dewatering, Forests, Forest management, Vegetation regrowth, Birch trees, USSR.

The drying of non-forested low-lying bogs caused tree seedlings to grow comparatively faster. White birch was the pioneer specie among the afforestation plants of dried bogs. If there were pine seed sources in nearby areas, however, the bogs were occupied by pines, which mean that the birch population declined or disappeared. Due to the drying out, the fruit-bearing capacity of trees growing on the bogs before was improved. As a result, the nurseries of trees on the ridges were converted into seed-bearing populations which were vital for afforesting the dried areas with renumerative types of plants. Different types of forest were formed, depending on the dryness of the peat soil, density, thickness of the grass-moss cover and the incorporation of seeding material. The type of peat of the low-lying bog played a less important role in this process. (See also W79-01297) (Steiner-Mass)
W79-01305

THE EFFECT OF SEVERAL PHYSICAL AND CHEMICAL FACTORS UPON THE DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN DUNHAM POND, CONNECTICUT,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W79-01330

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE NORTH ARM,
Utah State Univ., Logan. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01346

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE,
Utah State Univ., Logan. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01347

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
R. W. Kortmann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 243, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, 1977. 117 p, 30 fig, 6 tab, 59 ref, append. OWRT A-054-CONN(5) and A-071-CONN(1), OWRT 14-31-0001-4007.

Descriptors: *Lakes, *Chemical analysis, *Water analysis, *Input-output analyses, *Sediment-water interfaces, *Lake sediments, *Phosphorus, *Nitrogen, *Silica, *Connecticut, Dunham Pond(Conn), *Soft-water bog lake, *Chemical budget, *Steady-state model, *Benthic contributions, *Ferrous iron, *Redox-active chemical, *Dialysis sampler, *Atmospheric contributions, Diurnal studies, Incubation method.

Chemical analyses of input, output, lake, and sediment interstitial waters have been performed over an annual cycle for a dimictic, soft-water bog lake. Lake budgets of total dissolved nitrogen (all forms), total phosphorus, and silica are presented and budget values are used in a steady-state model for estimating the flux between lake and sediment interstitial waters. Seasonal variations in ferrous iron concentrations, and flux calculations for ferrous iron migration from sediments by an incubation method (in situ), indicate that Fe2+ may be the major redox active chemical species poising BDEF. This additional iron (from benthic flux) has profound effects on the phosphorus content of lake waters, as indicated by diurnal studies and incubation results. Atmospheric contributions to the dissolved nitrogen and total phosphorus budgets are significant. When considered as a quantified 'point source', and included in the calculation of a phosphorus budget (after Dillon and Rigler), observed and predicted values of (P) are within 2%. Sediment interstitial water sampling methods are reviewed, and a dialysis sampler is described. This

sampler eliminates many of the problems associated with traditional sediment interstitial water sampling techniques. (de Lara-Conn)
W79-01423

A PRELIMINARY SURVEY OF THE ZOOPLANKTON AND BENTHOS OF AN ARCTIC LAKE NEAR PRUDHOE BAY, ALASKA,
Nevada Univ. System, Las Vegas. Desert Research Inst.
D. Nyquist, and J. LaPerriere.
Entomological News, Vol 84, p 227-234, 1973, 9 fig, 11 ref. A-035-ALAS(2).

Descriptors: *Benthic fauna, *Zooplankton, *Arctic, *Lakes, Surveys, *Alaska, Midges, Stoneflies, Oligocheates, *Benthos, *Prudhoe Bay area(Alas), Chironomids, Worms, Plecoptera.

A single lake on the North Slope of the Brooks Range in arctic Alaska was sampled for zooplankton and benthos. The sampling was not intensive enough to quantify the benthos, but some indication of its composition was obtained. The plankton was sampled with a five-liter Van Dorn bottle and the zooplankton separated with a 20-mesh (0.076 mm) screen. The benthos was sampled with a small (15.24 cm square) Ekman drainage. The zooplankton consisted of calanoid copepods, a single cyclopoid copepod, Daphnia sp., and Ceratium sp. The diversity of this zooplankton was calculated to be 1.06. The benthos consisted of oligocheates, Nemoura sp., Cricotopus (Paratricho-cladius) cf. alpicola Zett, Stictochironomus rosenscholdi, Paratanytarsus sp., Stictochironomus histrio type, Cryptochironomus, and Procladius (Psilotanypus) sp., and an unidentified Procladius, sp.
W79-01427

NITROGEN FERTILIZATION OF PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W79-01439

ACUTE EFFECTS OF UNDERWATER CONSTRUCTION BLASTING ON FISHES IN LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W79-01452

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
For primary bibliographic entry see Field 5C.
W79-01471

A DYNAMIC WATER QUALITY MODEL OF LAKE BIWA - A SIMULATION STUDY OF THE LAKE EUTROPHICATION,
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
For primary bibliographic entry see Field 5C.
W79-01475

NUTRIENT RECOVERY FROM FARM PONDS: HYDROPONIC PLANT PRODUCTION AND OTHER MEANS, A REVIEW,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 5C.
W79-01477

2I. Water In Plants

THE EFFECT OF DIRUNAL VARIATION IN LIGHT AND TEMPERATURE ON THE ACETYLENE REDUCTION ACTIVITY (N2 FIXATION) OF SUBTERRANEAN CLOVER,
California Univ., Davis Dept. of Agronomy and Range Science
J. F. Eckart
Available from the National Technical Information Service, Springfield, VA 22161, as PB-288 655, Price codes: A03 in paper copy A01 in microfiche. MA Thesis, 1978. 25 p, 4 fig, 49 ref. (California Water Resources Center Project UCAL-WRC-W-495), OWRT-B-175-CAL(3).

Descriptors: *Clovers, *Temperature, *Light, *Diurnal, Acetylene reduction activity, Nitrogen fixation, Plant physiology, Photoperiodism, Plant physiology.

The effect of diurnal variation in light and temperature on acetylene reduction was investigated using 30 day old subterranean clover plants. Acetylene reduction showed dirunal fluctuations under constant light and 12/12 hour light/dark regimes when root and air temperature fluctuated by 7C and 14C, Respectively. In the presence of constant temperature and normal photoperiods or constant light, however, no diurnal fluctuation of actylene reduction was measured. Under both environmental regimes with constant temperature a gradual increase in acetylene reduction activity, which may have been an artifact, was observed. These patterns suggest that diurnal changes in acetylene reduction result more from fluctuating temperature than from photoperiods. (Synder-Calif, Davis)
W79-01092

CALCIFICATION AND ITS ROLE AMONG THE MACROALGAE,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
M. Littler.
Micronesica, Vol. 12 No 1, p. 27-41, 1976. 7 fig, 3 tab, 50 ref. (California Water Resources Center Project UCAL-WRC-W-491) OWRT-A-054-CAL(3).

Descriptors: *Calcareous soils, *Algae, Caleium carbonate, Limestone, *Calcareous algae, Bioindicators.

Calcareous algae are important components of the limestone deposits of antiquity. Such deposits are often associated with petroleum reserves and, for this reason, calcareous algae have attracted attention from a broad spectrum of workers. While nearly all have agreed that calcifying algae of modern depositional habitats are abundant, diverse and ecologically important, critical quantitative information is scarce and these organisms are in nearly every respect poorly known. Calcification is characterized as the accumulation of calcium carbonate in all physical states within or upon the thallus, including crystalline and non-crystalline aggregates and amrophous impregnation. The first portion of this paper surveys the calcium-depositing habit. Secondly, an overview of recent work on the distribution and ecology of calcareous macrophytes is developed. The last part considers the scant information on physiological mechanisms including the importance and possible functional roles of calcification. In this connection, certain aspects of research on calcium-carbonate production rates and ratios in calcareous algae are reviewed with suggestions of areas where future work is needed. (Snyde-Calif, Davis)
W79-01097

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. Ffolliott, and M. Baker, Jr.
U.S.D.A. Forest Service, General Technical Rpt. RM-44, 1977, Rocky Mountain Forest and Range Exp. Station, Fort Cullins, Colorado 7 p 2 fig, 1 tab, 20 ref. OWRT A-066-ARIZ(4), 14-34-0001-6003.

Descriptors: *Arizona, *Ponderosa pine trees, *Sandstones, *Sedimentary rocks, *Suspended solids, *Water yield, *Water quality, Plant growth, *Suspended sediment, *Dissolved chemical constituents, *Volcanic soils, Site index, Herbage production, Forest floor.

Physiographic, hydrologic, and biotic information was examined in a four-year study of a ponderosa pine exosystem on porous sandstone soils in north-central Arizona. Based on this information and that obtained from ponderosa pine ecosystems on soils derived from volcanic materials, the following comparisons can be made regarding products and used of the land: Annua water yield measured at the flume from sandstone soils is approximately 25% of that from volcanic soils. Physical and chemical water qualities (suspended sediment concentrations and dissolved chemical constituents) are similar on both soil types. Forest densities on the sandstone soils are less than on the volcanics, and therefore annual growth of the ponderosa pine stands on sandstone is greater because of higher individual tree growth rates. Site index is also higher on the sandstone soils; timber quality is similar on both areas. Total herbage production on the sandstone soils is less than has been estimated on the volcanics. Futhermore, herbage production on sandstone soils at a given level of tree density or depth of forest floor is less than produced on volcanic soils. (White - Arizona)
W79-01099

ASPECTS OF THE LIFE HISTORY AND GROWTH OF ACRONEURIA (CALINEURIA) CALIFORNICA IN A SIERRA FOOTHILL STREAM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
C. A. Siegfried, and A. W. Knight.
Annals of the Entomological Society of America, Vol. 71, No. 1, p 149-154, January 1978. 5 fig, 23 ref. (California Water Resources Center Project UCAL-WRC-W-243).

Descriptors: *Entomology, *Aquatic insects, Life history studies, Nymphs, California, Squirrel Creek(Calif), Standing crops, Growth stages, Larval growth stage, Calineuria, Acroneuria.

Aspects of the life history and growth of Acroneuria (Calineuria) californica Banks (Plecoptera: Perlidae) were studied in Squirrel Creek, Nevada County California. Numerical standing crop ranged from 159 nymphs/m2 (in Aug. 1973) to 4 nymphs/2 (in Nov. 1973). The Nov. minimum coincided with the onset of the rainy winter season. Nymphal life was ca. 18 months. Emergence was observed from late April through June. Eggs were laid in May and June but did not begin to hatch until the following Jan. The loss of larger nymphs during winter washouts is reflected in growth curves. Annual production, obtained by the instantaneous-growth method, was 2.26 g dry weight/m2/year, with an annual turnover ratio of 4.21. Cohert turnover, calculated from the life-history instantaneous-growth rate, was estimated at 6.5. (Snyder-California)
W79-01125

RELATIONSHIPS BETWEEN MINERAL SUPPLY AND GROWTH OF NARTHECIUM OSSIFRAGUM (L.) HUDS. ON MIRE ECOSYSTEMS,
Reading Univ. (England). Dept. of Agriculture; and Reading Univ. (England). Dept. of Horticulture.
For primary bibliographic entry see Field 2H.
W79-01216

THE ECOTONE BETWEEN SPARTINA FOLISOA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.

For primary bibliographic entry see Field 2L.
W79-01218

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01236

NUTRIENT FLUXES IN PRECIPITATION, THROUGHFALL, AND STEMFLOW IN AN OAK-HICKORY FOREST,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
G. L. Rolfe, M. A. Akhtar, and L. E. Arnold.
Water Resources Bulletin, Vol. 14, No. 5, p 1220-1226, October 1978. 4 tab, 25 ref.

Descriptors: *Nutrients, *Precipitation(Atmospheric), *Throughfall, *Stemflow, *Deciduous forests, *Illinois, Canopy, Ecosystems, Nitrogen, Phosphorus, Cycling nutrients, Oak trees, Hickory trees, Dusts, Litterfall.

Nutrient fluxes in precipitation, throughfall, and stemflow were studied in an oak-hickory forest in southern Illinois for a three-year period beginning in 1973. Nutrient inputs in these water related pathways were approximately one-half those of litterfall, a major nutrient return mechanism. Considering these water-carried nutrients (116 kg/ha/yr), 38% was contributed by precipitation, 35% by throughfall, and approximately 27% by stemflow. Although the total nutrient input is only one-half that of litterfall, the net impact of short-term nutrient requirements is considerable because of the immediate availablity of water-carried nutrients. Nutrient inputs in litter represent a delayed return mechanism because of the relatively slow decomposition process. (Visocky-ISWS)
W79-01246

HABITAT USE AND HOME RANGE OF MALLARDS BREEDING IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
D. S. Gilmer, I. J. Ball, L. W. Cowardin, J. H. Riechmann, and J. R. Tester.
Journal of Wildlife Management, Vol. 39, No. 4, p 781-789, October, 1975. 2 tab, 38 ref.

Descriptors: *Mallard ducks, *Habitats, *Wetlands, *Home ranges, Bogs, Waterfowl, Ducks, *Minnesota, Lakes, Swamps, Reproduction, Telemetry.

Telemetry techniques were used to study habitat use and home range of 12 drake and 12 hen mallards (Anas platyrhyanchos) in the forrested region of north-central Minnestoa during the 1968-72 breeding seasons. Cricumneutral bogs and seasonal wetlands were the most frequently used communities; the lakeshore communities most used were sand-gravel, overhanging brush, and bog mat. Based on the availability of habitat, the highest preference shown was for the seasonal community and the least for the softwood swamp; however, all communities were used to some extent during the breeding season. Lakeshore was always among the habitats most frequently used by pairs. Twelve nests were found, none in nonpermanent wetlands and three in upland forest sites. Mean home range was 210 ha for hens and 240 for drakes. (Stihler-Mass)
W79-01287

GROWTH AND MORTALITY OF LITTORINA IRRORATA SAY IN THREE NORTH CAROLINA MARSHES,
North Carolina Univ. at Chapel Hill. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W79-01289

GROWTH AND RESOURCE ALLOCATION RESPONSES OF SPARTINA ALTERNIFLORA LOISEL TO THREE LEVELS OF NH SUB 4-N, FE, AND NACL IN SOLUTION CULTURE,
Georgia Univ., Athens. Dept. of Botany.
B. L. Haines, and E. L. Dunn.
Botanical Gazette, Vol. 37, No. 3, p 224-230, 1976. 1 fig, 1 tab, 33 ref.

Descriptors: *Salt marsh, *Marsh plants, *Ammonia, *Salinity, *Plant growth, *Soil-water-plant relationships, Wetlands, Marshes, Growth rates, Grasses, Iron, Plant growth regulators, Root development.

Seedlings of Spartina alterniflora were grown for eleven weeks in a solution culture factorial experiment each of NH sub 4-N, Fe, and NaCl. Plant height, total dry weight, rhizome length, rhizome weight, and root weight were significantly affected by NH sub 4-N and by NaCl but not by Fe concentrations. In general, increasing NH sub 4-N promoted growth except at the highest salinity. Shoot-to-root ratios indicated decreased resource allocation to root production with increase of both NH sub 4-N and NaCl. Shoot-to-rhizome weight ratios showed allocation to rhizomes was little affected by salinity but was favored by increased amounts of NH sub 4-N and Fe. For the three factors studies, results suggested that future field studies of s. alterniflora should focus on relations of process rates to variations in concentrations of nitrogen and of salt rather than or iron. (Steiner-Mass)
W79-01294

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01296

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye.
For primary bibliographic entry see Field 2H.
W79-01297

SOME RESULTS OF STATION RESEARCH ON THE INTERRELATION OF FOREST AND BOG IN WESTERN SIBERIA,
For primary bibliographic entry see Field 2H.
W79-01298

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
For primary bibliographic entry see Field 2H.
W79-01300

THE SHIFT OF BOG VEGETATION UNDER THE INFLUENCE OF DRYING,
For primary bibliographic entry see Field 2H.
W79-01304

ABOUT THE AFFORESTATION OF BOGS IN TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01305

TRANSPLANTATION OF SALT MARSH VEGETATION. II. GEORGETOWN, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W79-01306

ULTRASTRUCTURE OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS INFECTED WITH AS-1 VIRUS,
California Univ., Riverside. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5C.
W79-01334

STANDING CROPS OF MARSH VEGETATION OF TWO TRIBUTARIES OF CHESAPEAKE BAY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W79-01433

2J. Erosion and Sedimentation

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-01007

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01014

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01022

SAND TRANSPORT MODEL OF BARCHAN DUNE EQUILIBRIUM,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A. D. Howard, J. B. Morton, M. Gad-El-Hak, and D. B. Pierce.
Sedimentology, Vol. 25, No. 3, p 307-337, June 1978. 13 fig, 2 tab, 33 ref. NASA NGR-47-005-172.

Descriptors: *Dunes, *Model studies, *California, *Wind erosion, Mathematical models, Geomorphology, Aeolian soils, Movement, Shape, Size, Dune sands, Sediment transport, Analytical techniques, Equations, On-site investigations, Deposition(Sediments), Erosion rates, Flow, *Salton Sea(California), *Barchan dunes.

Erosion and deposition over a barchan dune near the Salton Sea, California, was modelled by bookkeeping the quantity of sand in saltation following streamlines of transport. Field observations of near-surface wind velocity and direction plus supplemental measurements of the velocity distribution over a scale model of the dune were combined as input to Bagnold-type sand-transport formulas corrected for slope effects. A unidirectional wind was assumed. The resulting patterns of erosion and deposition compare closely with those observed in the field and those predicted by the assumption equilibrium (downwind translation of the dune without change in size or geometry). Discrepancies between the simulated results and the observed or predicted erosional patterns appear to be due largely to natural fluctuation in the wind direction. Although the model includes a provision for a lag in response of the transport rate to downwind changes in applied shear stress, the best results are obtained when no delay is assumed. The shape of barchan dunes is a function of grain size, velocity, degree of saturation of the oncoming flow, and the variability in the direction of the oncoming wind. Smaller grain size or higher wind speed produce a steeper and more blunt stoss-side. Low saturation of the inter-dune sandflow produces open crescent-moon-shaped dunes, whereas high saturation produces a whaleback form with a small slip face. Dunes subject to winds of variable direction are blunter than those under unidirectional winds. A need exists for comprehensive field measurements of sand flow (quantity, grain size, and vertical distribution) and the associated velocity profiles at

many points on and upwind from natural dunes in order to refine the model presented. (See also W73-06244) (Humphreys-ISWS)
W79-01043

BED FORMS AND STRATIFICATION TYPES OF MODERN GRAVEL MEANDER LOBES, NUECES RIVER, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
T. C. Gustavson.
Sedimentology, Vol. 25, No. 3, p 401-426, June 1978. 20 fig, 1 tab, 36 ref.

Descriptors: *River beds, *Texas, *Meanders, *On-site investigations, Streambeds, Shape, Distribution patterns, Dunes, Sediment transport, Gravels, Stratigraphy, Alluvial channels, Hydrologic aspects, On-site data collections, Bed load, Flow, Discharge(Water), Gradation, Banks, Sediments, Particle size, *Nueces River(Texas), Gravel bars, Meander lobes.

All major streams draining the southwestern flank of the Edwards Plateau in south-central Texas transport large volumes of gravel and sandy muddy gravel and are developing meander lobe sequences consisting predominantly of coarse gravel. The largest of these streams, the Nueces River, has a sinuosity index of 1.3 and an average stream surface slope of 1.8 m/km in the study area. Stream discharge is variable and has ranged from no flow to more than 17,000 cu m/s. Mean clast b-axis length for the 10 largest clasts at 13 sample sites ranged from 2.5 to 10.8 cm. Velocities of 2.7-4.4 m/s one meter above the stream bed are required to transport these clasts. Stream velocities of these magnitudes occur about once in 8 years when the discharge exceeds 3,300 cu m/s. Mean grain size of alluvium ranges from 1.2 to 3.4 cm. At a flow depth of 1 m, sediment of this size has a critical erosion velocity of 1.8-3 m/s. Velocities of this magnitude occur about once in two years when discharge exceeds 340 cu m/s. Under these conditions flow is subcritical, with critical shear stresses on depositional surfaces ranging from 6.4 to 12.7 kg/sq m. Gravel clasts are imbricated, and channel bed forms are predominantly transverse gravel bars with slip faces ranging up to 2 m high and wavelengths in excess of 100 m. Stratification includes graded planar crossbeds and horizontal beds. Lower lateral accretion face sediments are also predominantly transverse bars; upper lateral accretion face deposits occur as longitudinal gravel ridges deposited in the lee of vegetation and, less commonly, as chute bars. Near the upper limit of meander lobes where vegetation is heavy, mud and muddy sand occur as overbank deposits; in these deposits, sedimentary structures other than desiccation cracks are rare. (Humphreys-ISWS)
W79-01044

FIELD STUDY OF SEDIMENT TRANSPORT CHARACTERISTICS OF THE MISSISSIPPI RIVER NEAR FOX ISLAND (RM 355-6) AND BUZZARD ISLAND (RM 349-50),
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. Nakato, and J. F. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 244, Price codes: A05 in Paper copy, A01 in Microfiche. 92 p, 46 fig, 6 tab, 6 ref.

Descriptors: *Sedimentation, *Sediment transport, *Mississippi River, *Sampling, Surveys, On-site investigations, On-site data collections, Discharge(Water), Velocity, Flow, River flow, Sediments, Sediment distribution, Suspended solids, Shoals, Bed load, Distribution patterns, Data processing, Regression analysis, Rivers, Hydrology.

A field study was conducted in order to obtain a better understanding of the flow and sediment transport mechanisms responsible for the recurrent shoaling that has been experienced in the vecinities of Fox Island (between RM 355 and RM 356) and Buzzard Island (between RM 349 and RM 350) in Pool 20 between Keokuk, Iowa, and Canton, Missouri, in the Mississippi River. Three sets of detailed data on transverse and streamwise distributions of flow velocity, suspended sediment discharge, bedload discharge, bed-material properties, and flow depth were otained for the high, intermediate, and low river stages during the period between May and September, 1976. The field data were used to establish empirical relationships between the bed-load discharge, Q sub B (tons/day); and the water discharge, Q (cfs); and mean velocity, U (ft/s) in the study reaches. It was found that Q sub B varies as approximately to 4th power of U or Q. The suspended load discharge, Q sub S (tonsl/day), was found to vary as the square, roughly, of Q. The unit total load, Q sub T (tons/ft/s), was found to vary as the square, approximately, of the unit water discharge, q (cfs/ft). In the vicinity of Buzzard Island reach, the Mississippi River flow was found to bifurcate, with in excess of 25% of the water discharge passing through the secondary side channel. This flow bifurcation and the attemdant velocity reduction downstream from it in the main channel were found to be responsible in large measure for the current shoaling in this reach. (Sims-ISWS)
W79-01065

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W79-01087

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
J.D. Buck.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-288 652, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, 1978. 27 p, 13 fig, 5 tab, 12 ref. OWRT A-069-CONN(1), 14-31-001-6007.

Descriptors: *Sedimentation, *Assay, *Organic matter, Lotic environment, *Connecticut, Estuaries, Microbial degradation, Bioassay, *Copps Brook watershed(Conn), Estuarine environment, *Microbial metabolism, *Sensitive tetrazolium, Salt assay, Total biological metabolism, Shallow estuary, Particulate organic matter, Organic supply, Budget.

A pristine, forested coastal watershed (18 km) in southern New England was studied for three years to determine (1) the effect of a small (22 ha) drinking water reservior on nutrient and water runoff, and (2) the relative importance of the watershed in supplying organic sediment to the receiving esturay (29 ha). Organc and inorganic freshwater runoff data were supplemented with estuarine sedimentation rate data to construct a first-order organic supply budget for the estuary. The reservoir system retained significant amounts of dissolved and particulate organic carbon and N03-N, but O-P04-P runoff was unaffected. Lentic conditions in the reservior allowed for substantial amounts of primary production by photoplankton which reduced N03-N export to the estruary by a third. Freshwater delivery of particulate organic matter to the estuary equaled the amount from marine sources which was collected in sediment traps (c.23 mol organic carbon/sq m/ yr.). Total deposition of organic material in the estruary was estimated to range between 120 and 300 mol/sq m/ yr, mostly from estuarine primary production. Investigations of the chemistry of the interstitial pore waters of the estuarine sediments showed that organic matter deposition rates and the ambient hydrologic regime induce facultative and anaerobic metabolism by the microflora. A sensitive assay of total biological metabilism using tetrazolium salts is being developed to (1) obtain estimates of aerobic and anaerobic metabolism and, (2) complete a first-order organic matter supply and demand model for this aquatic/marine system. (Matson-Conn)
W79-01091

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
For primary bibliographic entry see Field 5B.
W79-01250

METALS FROM URBAN RUNOFF IN DATED SEDIMENTS OF A VERY SHALLOW ESTUARY,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 5A.
W79-01251

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W79-01253

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01380

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01382

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

2K. Chemical Processes

DONNAN DIALYSIS ENRICHMENT OF CATIONS,
Southern Illinois Univ. at Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox, and J. E. DiNunzio.
Analytical Chemistry, Vol. 49, No. 8, p 1272-1274, July 1977. 2 fig, 2 tab, 9 ref. OWRT A-087-ILL(1).

Descriptors: *Dialysis, Copper, Chemical analysis, Water analysis, *Cations, *Donnan dialysis, Spectroscopy, Ions, Ion transport, Analytical techniques, *Ion selective membranes, *Atomic absorption spectroscopy, Chemical extraction.

Factors which influence the rate of cation enrichment by Donnan dialysis have been identified. The rate was found to depend upon both the identity of the cation and the ionic strength of the receiver electrolyte. with receiver electrolytes selected as salts of cations from Periodic Groups IA - IIA, the rate of enrichment varied as follows: increased with group number and increased with smaller atomic number within a group. Thus, A1 (III) was selected as the receiver cation; to minimize the possibility of hydroxide precipitation, a 10-3M A1(III)/0.2M Mg(II) mixture was generally employed. The addition of Mg was required because the enrichment rate increases with receiver ionic strength and because the maximum sample ionic strength which permits Donnan dialysis enrichment depends upon that of the receiver. With the above receiver, 10-fold enrichments of Cu(II) samples were accomplished in 30 minutes; the enrichment was independent of sample ionic strength up to 0.01; and the rate of enrichment was directly proportional to Cu concentration over the range 1.4x10-7-2.5x10-5M. With a two hour preconcentration the detectability was 3x10-8M by atomic absorption spectrometry. Factors which affect the

precision were also identified. Typical relative standard deviations were 2% when an internal standard was used.
W79-01011

GEOCHEMICAL IMPLICATIONS OF SUMMER MONSONNAL RAINWATER COMPOSITION OVER INDIA,
Bhabha Atomic Research Center, Bombay (India). Div. of Radiological Protection.
R. Sequeira, and D. Kelkar.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1390-1396, September 1978. 6 fig, 3 tab, 25 ref.

Descriptors: *Monsoons, *Rainfall, *Salts, *Water chemistry, Sampling, Surveys, Chemical analysis, Rainfall, Rain water, Sodium chloride, Sodium, Potassium, Calcium, Magnesium, Chlorides, Sulfates, Chemicals, Chemistry of precipitation, Meteorology, *India.

Rainwater was sampled from 10 coastal and inland stations over India during the entire monsoon period of 1975. Major sea salt constituents were determined analytically. Sea salt deposition values based on the sodium content were presented for each station. It is estimated that during a monsoon period some 4,000,000 tons of sea salt are likely to be transported into the country. With the exception of calcium, the overall seasonal proportions of sea salt constituents in coastal rainwater indicate either minor or no differences as compared with the composition of seawater. A high excess of calcium was found in all rainwater samples. Average excess at the coast was found to be 400-1000% over that expected on the basis of the sodium content. The calcium is uniformly distributed over the country, with average concentration of 1.1 mg/l for the present network of sampling stations. It was proposed that the excess calcium is predominantly of desert origin and is mostly from Arabia and/or Iran. Excesses of potassium and sulfate and depletion of chloride were observed in inland rainwater. The two excesses were believed to be of local continental origin. (Sims-ISWS)
W79-01039

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5A.
W79-01042

THE DENSITY OF SEAWATER SOLUTIONS AT ONE ATMOSPHERE AS A FUNCTION OF TEMPERATURE AND SALINITY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
F. J. Millero, A. Gonzales, and G. K. Ward.
Available from the Technical Information Service, Springfield, VA 22161 as AD-A029 088. Price codes: A03 in paper copy, A01 in microfiche.
Journal of Marine Research, Vol. 34, No. 1, p 61-93, February 23, 1976. 6 fig, 11 tab, 52 ref. ONR N00014-75-C-0173, NSF GA-40532.

Descriptors: *Density, *Sea water, *Salinity, *Physical properties, *Analytical techniques, *Temperature, Specific gravity, Properties, Chemical properties, Water temperature, Saline water, Pressure, Water quality, Oceanography, Atmospheric pressure, Magnetic float densimeter.

The relative density of diluted and evaporated standard seawater solutions was determined at one atmosphere with a magnetic float densimeter and a suspension balance from 0.5 to 40 parts per thousand salinity and 0 to 40C. Tabulated results of the relative densities were shown. (Henley-ISWS)
W79-01064

QUANTITATIVE DETERMINATION OF QUATERNARY AMMONIUM BASES (QAB) IN WATER AND WASTEWATER BY THIN LAYER CHROMATOGRAPHY,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W79-01070

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
For primary bibliographic entry see Field 3C.
W79-01106

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01133

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
D. J. Boatman, P. D. Hulme, and R. W. Tomlinson.
Journal of Ecology, Vol. 63, No. 3, p 903-912, November, 1975. 3 fig, 4 tab, 10 ref.

Descriptors: *Bogs, Monthly, *Nutrient cycles, *Seasonal, Wetlands, Peat, Sodium, Magnesium, Calcium, Sodium, Silver Flowe National Nature Preserve(Great Britain), Craigeazle Bog(Great Britain), Brishie Bog(Great Britain), Ombrotrophic mires.

The concentrations of sodium, magnesium, potassium, and calcium in the rain and in several deep pools, and in the pH of the pools, were measured at monthly intervals on two ombrotrophic mires of the Silver Flowe series. The annual inputs of each ion have been calculated and it is considered that the results for Craigeazle bog are more representative of the area as a whole than those of Brishie bog. Considerable variations in the concentration of the ions were found both between pools and, for mean values, from month to month. For certain ions, there were also marked differences between the pools and the rain, particularly in summer. Marked differences in the concentration of potassium were found between pools containing large amounts of Sphagnum spp. and those containing only small amounts. From the data the proportions of each ion absorbed by the peat and absorbed by the plants have been estimated. The sequence, in order of increasing removal from the percolating water, is found to be Na<Mg<K, Ca. (Steiner-Mass)
W79-01212

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
D. R. Stoddart, G. W. Bryan, and P. E. Gibbs.
Journal of Natural History, Vol. 7, No. 1, p 33-46, January-February, 1973. 6 fig, 1 tab, 39 ref.

Descriptors: *Mangrove swamps, *Ecological distribution, *Water chemistry, Swamps, Wetlands, Calcium, Strontium, Sodium, Potassium, Magnesium, Barbuda(West Indies).

Mangrove vegetation, comprising not only Laguncularia and Conocarpus, but also a closed woodland of Rhizophora, is found in inland situations in Barbuda having no connection with the sea and associated with geological and geomorphic features of either late Pleistocene or early Holocene age. These mangroves are associated with brackish water. Analyses show lowered concentrations of sodium, potassium and magnesium and higher concentrations of calcium and strontium compared with sea water having the same chloride content. The higher calcium and strontium concentrations probably result from diagenetic changes in the limestone substrate. (Stihler-Mass)
W79-01215

ION EXCHANGE MEMBRANE METHODS FOR CONTINUOUS REMOVAL OF IONS FROM WATER AND TRACE CHEMICAL ANALYSIS,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W79-01327

EVALUATION OF MICROMOLAR COMPLEXIMETRIC TITRATIONS FOR THE DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATERS,
North Carolina, State Univ. at Raleigh. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01344

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER BY COBALT (III) COMPLEXATION,
North Carolina State Univ. at Raleigh. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01345

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01369

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
D. E. Erdmann, and H. E. Taylor.
Analytica Chimica Acta, Vol 99, p 269-274, 1978. 3 fig, 3 tab, 5 ref.

Descriptors: *Water analysis, *Hydrogen ion concentration, *Specific conductivity, *Analytical techniques, *Instrumentation, Laboratory tests, Evaluation.

An automated, continuous-flow system is utilized to determine specific conductance and pH simultaneously in natural waters. A direct electrometric procedure is used to determine values in the range pH 4-9. The specific conductance measurements are made with an electronically modified, commercially available conductivity meter interfaced to a separate module contaning the readout control devices and printer. The system is designed to switch ranges sutomatically to accommodate optimum analysis of widely varying conductances. Thirty samples per hour can be analyzed. Comparison of manual and automated procedures for 40 showed that the average differences were 1.3 percent for specific conductance and 0.07 units for pH. The relative standard deviation for 25 replicate values for each of five samples was significantly less than 1 percent for the specific conductance determination; the standard deviation for the pH determination was < or = 0.06 pH units. (Woodard-USGS)
W79-01374

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01387

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.

W79-01422

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
For primary bibliographic entry see Field 5A.
W79-01474

2L. Estuaries

CHANGES IN SUBMERGED AQUATIC MACROPHYTE POPULATIONS AT THE HEAD OF CHESAPEAKE BAY, 1958-1975,
Florida Univ., Gainsville, FL. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-01030

WIND EFFECTS ON SURFACE TO BOTTOM FRONTS,
Woods Hole Oceanographic Institution, MA.
G. T. Csanady.
Journal of Geophysical Research, Vol. 83, No. C9, p 4633-4640, September 20, 1978. 11 fig, 7 ref.

Descriptors: *Water circulation, *Winds, *Lake Ontario, *Lakes, *New England, *Continental shelf, Model studies, Mathematical models, Coasts, Tidal waters, Water temperature, Density, Salinity, Freshwater, Saline water, On-site investigations, Oceanography, Limnology, Fronts(Oceanic), Density fronts.

In nearshore regions, water of reduced density is frequently present owing to freshwater influx or spring heating. Under some circumstances, light nearshore water is confined to one side of a density front, extending from surface to bottom, and is called 'spring thermocline' or 'shelf edge front'. The shape and permanency of this front are affected by wind stress, which may interfere with the momentum balance in a direction parallel to the front and cause geostrophic adjustment motions normal to the front. A simple geostrophic adjustment theory elucidated some of the more important effects of wind on such fronts. Winds opposing the geostrophic flow above the inclined front tend to flatten its shape and eventually destroy the front, sometimes causing the formation of a surface 'lens' or 'bubble'. Comparison with observations from Lake Ontario and from the New England continental shelves showed that the theory gives a realistic first-order description of frontal behavior. (Sims-ISWS)
W79-01045

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W79-01046

SOME OBSERVED STATISTICAL PROPERTIES OF SMALL SCALE TURBULENCE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
J. R. Wilson.
Mauscript Report Series No. 44, 1977. 125 p, 86 fig, 7 tab, 24 ref, 2 apend.

Descriptors: *Turbulence, *Turbulent flow, *Theoretical analysis, *On-site data collections, On-site investigations, Data collections, Mathematical models, Waves(Water), Flow, Instrumentation, Filters, Equations, Energy, Shores, Shalow water, Estuaries, *Small scale turbulence.

This study investigated the characteristics of the small scales of turbulent velocity and temperature fields in the atmospheric boundary layer, particularly distributions of the spatial derivatives, behavior of the structure functions, and the nature of the interactions leading to inertial transfer of energy between the larger and smaller scales of the turbulent flow. Observed statistical distributions of the differentiated downstream and X-wire signals did not conform accurately to the theoretically predicted logarithmic normal model, although there was good general agreement. Distribution of the sum of the squares of the differentiated X-wire signals was described well by the normal model. Temperature derivatives followed the log normal distribution better than did the velocity derivatives, but a poor signal-to-noise ratio prevented conclusive results. Observed structure functons conformed to present theory for the velocity and temperature data. Inertial transfer of energy in the downstream component behaved as would be expected intuitively. Specifically, net rate of arrival of energy was zero for wavenumbers where viscosity was unimportant, and positive where viscosity was important. Interactions of scale sizes differing by more than a factor of 10 in size did not contribute significantly to the energy transfers. Flow of downstream energy was from larger-to-smaller scale sizes for horizontal scales as large as 20 m. The mean inertial transfer of energy associated with interactions between downstream components only, was approximately equal to the mean rate of energy loss due to the corresponding dissipation term. (Sims-ISWS)
W79-01055

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

LIMNOLOGICAL CHARACTERISTICS OF THE POTOMAC ESTURY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W79-01195

PERSISTENT BLOOMS OF SURF DIATOMS ALONG THE NORTHWEST COAST,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01200

NITROGEN ACCRETION, AND THE NATURE AND POSSIBLE SIGNIFICANCE OF N2 FIXATION (ACETYLENE REDUCTION) IN A NOVA SCOTIAN SPARTINA ALTERNIFLORA STAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01214

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2K.
W79-01215

THE ECOTONE BETWEEN SPARTINA FOLISOA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64, No. 2, p 421-433, July, 1976. 3 fig, 4 tab, 47 ref.

Descriptors: *Salt marshes, *Rooted aquatic plants, *Ecotone, Biomass, Productivity, Tidal marshes, Standing crop, Bay, Spartina, Salicornia, *San Francisco Bay.

Measurements of above-ground and below-ground standing crop, and seasonal production of Spartina foliosa and Salicornia virginica were made in 1972 along 2 transects crossing the ecotone between the 2 species at mean high water level at Mare Island and the Petaluma River in the San Pablo area of San Francisco. The above-ground standing crop and production of Spartina declined in all respects as the ecotone was approached. The above-ground standing crop and production of Salicornia also decreased toward the ecotone, but are Mare Island, Salicornia was more productive per unit biomass or per stem in the Spartina zone than in the Salicornia zone. Living rhizomes and roots of Salicornia were found primarily in the upper 15 cm of soil. Living rhizomes and roots of Spartina were distributed throughout the soil profile but tended to be absent from the upper 15 cm in the Salicornia zone. Total standing crop and production, including both species, decreased to a minimum at the middle of the ecotone. It appears that the zonation is dependent on physical factors and physiological resonses rather than on interspecific competitive effects. (See also W79-01218)(Maroncelli-Mass)
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64(3), p 793-809, November, 1976. 4 fig, 4 tab, 47 ref.

Descriptors: *Salt marshes, *marsh plants, *Distribution patterns, *Salinity, Wetlands, Tidal marshes, Ecological distribution, Soil water, Halophytes, California, *San Francisco Bay.

Measurements were made of soil water and salt content along the ecotone between Spartina foliosa and Salicornia virginica. During the rainless late spring and summer growing season, the apparent salinity in the upper littoral Salicornia zone at a depth of 0-35 cm was of the order of 0.25 m-osm./g water greater than that in the mid-littoral Spartina zone. The differences between the zones became insignificant during the winter rainy season, when the plants were essentially dormant. Hydroponic experiments show that S. foliosa plants are less tolerant of rapid salinity changes, and their growth is much more inhibited by higher root medium salinities than S. virginica plants. The growth of the Spartina was severely reduced at salinities above 0.6 m-osm./g water, whereas the growth of Salicornia was not significantly inhibited by salinities up to 1.4 m-osm./g water and its roots seemed to be very effective at excluding ions supplied in root media with high NaCl contents. Spartina was relatively ineffective at excluding such ions and its water use efficiency declined markedly with increasing salinity while that of Salicornia increased slightly. (See also W79-01217)(Steiner-Mass)
W79-01218

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6G.
W79-01220

PRODUCTION AND DYNAMICS OF EXPERIMENTALLY ENRICHED SALT MARSH VEGETATION: BELOWGROUND BIOMASS,
Marine Biological Lab., Woods Hold, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W79-01222

RESPONSE IN PRODUCTION OF CORD GRASS, SPARTINA ALTERNIFLORA, TO INORGANIC NITROGEN AND PHOSPHORUS FERTILIZER,
Delaware Univ., Newark. Dept. of Biological Sciences.
M. J. Sullivan, and F. C. Daiber.
Chesapeake Sci. 15(2), p 121-123, 1974.

Descriptors: *Cord grass, Fertilizers, Grasses, Inorganic nitrogen, Marshes, *Nitrogen, Nutrients, *Phosphorus, *Production, Spartina-alterniflora.

Fertilization of a low marsh area inhabited by S. alterniflora, with inorganic N and P compounds was conducted on a monthly basis during the 1972 growing season. Yield, as measured by an increase in fresh weight after harvest, was significantly higher in the N fertilized area than the P fertilized site or control area. No effect of P could be demonstrated. It was concluded that N supplies are limiting production of dwarf form S. alterniflora in the salt marsh under study. Introduction of additional sources of inorganic N into a marsh deficient in N would tend to increase its productivity.--Copyright 1974, Biological Abstracts, Inc.
W79-01225

AN ECOLOGICAL STUDY OF A BALDCYPRESS SWAMP IN ST. CHARLES PARISH, LOUISIANA,
Army Engineer District, New Orleans, LA.
G. N. Montz, and A. Cherubini.
Castanea, Vol. 38, No. 4, p 378-386, December, 1978. 3 fig, 2 tab, 18 ref.

Descriptors: *Swamps, *Succession, *Ecology, *Baldcypress, Wetlands, *Louisiana, Rooted aquatic plants, Standing waters, Reproduction.

A baldcypress (Taxodium distichum (L.) Richard) swamp bordering a marsh in St. Charles Parish was studied by the quadrat method. A dense undergrowth of alligatorweed (Alternanthera philoxeroides (Mart) Griseb.) covered most of the study area. Plant succession with extension of baldcypress into the marsh was studied by comparing township maps of 1860 and quadrangle maps of 1955 and 1957 to quadrangel maps of 1969. Only baldcypress was recorded, with treee diameters increasing from the marsh-swamp zone into the swamp. Of the 639 trees recorded in the study area, 357 were dead. (Stihler-Mass)
W79-01226

METALS FROM URBAN RUNOFF IN DATED SEDIMENTS OF A VERY SHALLOW ESTUARY,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 5A.
W79-01251

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01254

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
D. R. Lynch, and W. G. Gray.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Proceedings Paper 14105, p 1409-1428, October 1978. 6 fig, 2 tab, 15 ref.

Descriptors: *Tidal effects, *Computer models, *Flow friction, *Waves(Water), *Bathymetry, Circulation, Fluid mechanics, Analytical techniques, Methodology, Equations, *Shallow water equations, Wind stress, Tidal forcing function.

A class of solutions of the linearized shallow water equations was presented. The solutions involve two spatial dimensions plus time. Special emphasis was placed on the dynamic steady-state. Wind stress, bathymetry which obeys a general power law, and two-dimensional circulation were included. The solutions give a broad spectrum of conditions against which model features can be tested. The availability of complete solutions for velocity, in addition to surface elevation, provides the means for verification of computed flow fields. The polar geometry solutions incorporate some boundaries which are not straight. Considerable economy can be realized by choosing a tidal forcing function that requires only one or two Fourier components in space. Various solutions presented are intended for use in testing and verification of numerical models. (Singh-ISWS)
W79-01256

THE DAM-BREAK WAVE AND THE BORE COLLAPSE ON A BEACH,
North Carolina State at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01263

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64, No. 3, p 812-819, November, 1976. 1 tab, 4 fig, 31 ref.

Descriptors: *Salt marshes, *Marsh plants, *Distribution patterns, *Tidal effects, Wetlands, Tidal marshes, Ecological distribution, Oxygen, Tides, California, Halophytes, *San Francisco Bay.

Measurements of soil oxygen diffusion rates along the ecxotone between Spartina and Saicornia indicated slight decreases with increases with increasing depth, but there were no significant differences between readings taken in either zone. These results, together with the observation of iron oxides surrounding Salicornia roots in the marsh soil, indicate that soil aeration is not an important factor affecting distribution of Spartina and Salicornia about the mean high water econton. Experiments in which plants were exposed to artificial tides of different heights indicated that growth of Salicornia seedlings and older plants is reduced by 30-34% by tides only 8 cm higher than in the control and lasting only 1/12 of the daylight period. The higher tides also inhibited re-rooting and the production of new branches. Growth of Spartina plants was not significantly affected. This indicates that growth inhibition resulting from tidal immerdion may be an important factor checking the seaward advance of Salicornia and tending to exclude it from the Spartina zone. (See also W79-01217 and W79-01218) (Steiner-Mass)
W79-01283

HABITAT USE AND HOME RANGE OF MALLARDS BREEDING IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 2I.
W79-01287

BIODEPOSITION BY SALT-MARSH INVERTEBRATES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5B.
W79-01288

GROWTH AND MORTALITY OF LITTORINA IRRORATA SAY IN THREE NORTH CAROLINA MARSHES,
North Carolina Univ. at Chapel Hill. Dept. of Zoology.
A. E. Stiven, and J. T. Hunter.
Chesapeake Science, Vol 17, No 3, p 168-176, September, 1976. 3 fig, 5 tab, 22 ref.

Descriptors: *Snails, *Salt marshes, *North Carolina, *Growth rates, *Mortality, Wetlands, Marshes, Gastropods, Marsh plants, Environmental effects, Density, Size, Growth stages.

Growth and mortality of the salt marsh gastropod, Littorina irrorata, were examined for one year at three levels of population density within three salt marshes. The standing crop of the dominant vegetation, Spartina alterniflora, differed among the three marshes. Gastropod density was manipulated by enclosures. Overall weight gains differed among marshes, density treatments, and three size classes of snails. Weight gain in the smallest individuals was significantly different among the marsh areas, but not the density treatments. For intermediate-sized individuals, growth rate differences occurred only in response to the density treatments. In adults, weight gain was different in the three marshes., but the density treatments had little effect. Within-cage mortality appeared independent of the density treatments, but significantly different among the marshes. (Steiner-Mass)
W79-01289

NITRATE AND NITRITE IN THE SURFACE WATERS OF TWO DELAWARE SALT MARSHES,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01291

GROWTH AND RESOURCE ALLOCATION RESPONSES OF SPARTINA ALTERNIFLORA LOISEL TO THREE LEVELS OF NH SUB 4-N, FE, AND NACL IN SOLUTION CULTURE,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-01294

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01296

TRANSPLANTATION OF SALT MARSH VEGETATION. II. GEORGETOWN, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Stalter.
Castanea, Vol. 38, No. 2, p 132-139, June, 1973. 3 tab, 12 ref.

Descriptors: *Salt marshes, *Rooted aquatic plants, *Ecological distribution, *South Carolina, Coastal marshes, Wetlands, Marshes, Aquatic plants, *Transplantation, Ecology.

A salt marsh located on the Baruch plantation at Georgetown, South Carolina includes four vegetation zones: the Upper High Marsh, Lower Marsh, Upper Low marsh, and Lower Low Marsh. Thirty plants of each of the dominant vegetations in each zone were transplanted into the other three vegetation zones, and thirty plants of each of the dominant species in each zone were dug up ad replanted in the same zone to serve as controls. Survival and growth rate of the transplants suggest that several species can tolerate conditions not found in their usual zones for a period of a year or longer. Salicornia virginica of the Lower Highe Marsh can grow in the Upper Low Marsh for a period of a year while Spartina patens of the Upper High Marsh demosntrated a ten percent survival rate when moved to the Lower High Marsh after a period of two years. The data suggest that there are two forms of Spartina alterniflora, a dwarf occupying the Upper Low Marsh, anda tall occupying the Lower Low Marsh. (Stihler-Mass)
W79-01306

TRENDS IN THE ABUNDANCE OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER BASIN,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5C.
W79-01322

PHOSPHORUS CYCLING IN NUPHAR LUTEUM COMMUNITIES IN THE LOWER CHOWAN RIVER, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.

W79-01326

FATTY ACID COMPOSITION OF ORGANIC DETRITUS FROM SPARTINA ALTERNIFLORA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01332

MIXING AND DISPERSION IN ESTUARIES,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01338

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-01356

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01362

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01385

TIDAL SAMPLER,
Depart of Energy, Wash., DC. (Assignee).
For primary bibliographic entry see Field 7B.
W79-01388

BREAKWATER,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). (Assignee).
For primary bibliographic entry see Field 8A.
W79-01400

STANDING CROPS OF MARSH VEGETATION OF TWO TRIBUTARIES OF CHESAPEAKE BAY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. A. Flemer, D. R. Heinle, C. W. Keefe, and D. H. Hamilton.
Estuaries, Vol. 1, No. 3, p 157-163, September 1978. 1 fig, 2 tab, 27 ref.

Descriptors: *Standing crops, *Estuaries, *Marsh plants, *Brackish water, *Nutrients, *Biomass, Salinity, Nitrogen, Seasonal, Productivity, *Chesapeake Bay, Marshes, Salt marshes, Coastal marshes, Plant populations, Aquatic populations.

A comparative study of the standing crop of marsh vegetation as made of the Patuxent River and Parker Creek, two tributaries of Chesapeake Bay. The biomass of marsh vegetation in the tidal freshwater and brackish regions of the Patuxent was relatively uniform with regard to salinity, seasonaly high concentrations of dissolved nitrogen, and phosphorus and nutrient gradient. Maximum values of biomass occurred in the tidal freshwater and slightly brackish water region of Parker Creek, a system whose nutrient concentrations approximated 20% ofthose of Patuxent River. Biomass values for the Patuxent River and Parker Creek averaged about 1417 and 895 grams per square meter dry weight, respectively, Estimates of total annual marsh production based on the maximum standing crop was 27 x 103 and 519 metric tons, respectively, for the Patuxent River and parker Creek. (EIS-Katz)
W79-01433

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
For primary bibliographic entry see Field 5C.
W79-01469

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
For primary bibliographic entry see Field 6A.
W79-01494

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SOLAR-ASSISTED STILL WITH VAPOR-COMPRESSION OPTION,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, E. D. Howe, and A. D. K. Laird.
Desalination, Vol. 22, p 41-54, 1977. 11 fig, 18 ref. (California Water Resources Center Desalination Project UCAL-S-106).

Descriptors: *Desalination, *Desalination apparatus, *Solar stills, *Vapor compression distillation, *Distillation, Evaporators.

A scheme is proposed where steam, generated from solar collectors, is used to drive a multiple-effect still with novel high performance rotating-disk wiped-film evaporators, thus resulting in an order of magnitude reduction of collector area. Mechanical energy to drive pumps and other accessories would be provided by a fuel-powered heat engine. During extended sunless periods, an engine drives a vapor compressor and keeps the plant operating at reduced capacity. Preliminary analysis indicate favorable economics for a medium capacity plant. (Snyder-Calif, Davis)
W79-01126

HIGH-TEMPERATURE SOLUBILITIES OF CALCIUM SULFATE HEMIHYDRATE AND ANHYDRITE IN NATURAL SEAWATER CONCENTRATES,
California Univ., Los Angeles. School of Engineering and Applied Science.
J. Glater, and J. Schwartz.
Journal of Chemical and Engineering Data, Vol. 21, No. 1, p 47-52, 1976. 6 fig, 4 tab, 18 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: Saline water, *Desalination, *Scaling, *Sea water, Solubility, *Calcium sulfate, Corrosion control.

Solubilities of high-temperature calcium sulfate modifications, hemihydrate and anhydrite, are measured in natural seawater at temperatures up to 165C. Scaling thresholds or concentration-temperature limits are determined over a temperature range of 91-162C. A new graphical method of scaling threshold evaluation is described. Experimental data are compared with literature values. Scaling thresholds calculated from the extended Debye-Huckel theory are in good agreement with the experimental results. A complete scaling threshold diagram for hemihydrate and anhydrite is also developed. Scaling threshold evaluation is important in the operation of desalting equipment, boilers, and cooling towers. (Snyder-Calif, Davis)
W79-01128

SPECIFICATION OF CELLULOSE ACETATE TO BE USED IN SEMIPERMEABLE MEMBRANES,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. C. Chan, and J. W. McCutchan.
Desalination, Vol 17, p 353-366, 1975. 9 fig, 4 tab, 18 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: *Saline water, *Desalination, Salinity, *Membranes, Membrane processes, Cellulose acetate membranes, *Semipermeable membranes.

Compositions of casting solutions of cellulose acetate were optimized in order to investigate the performance of the resulting semipermeable membranes as a function of viscosity rating and acetyl content of the polymer. The results show that the effect of viscosity of the cellulose acetate on membrane performance is as important as the effect of acetyl content in the ranges tested. (Snyder-California)
W79-01129

POTENTIODYNAMIC STUDIES OF ANTIMONY IN ACIDIC AND ALKALINE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01232

POLARIZATION AND PHOTOPOTENTIALS OF INSB IN NAOH,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01233

ELECTRODISSOLUTION OF NICKEL IN MOLTEN LICL-KC1,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01234

HYDROGEN EVOLUTION AND CORROSION BEHAVIOR OF FE-NI ALLOYS IN H2SO4 - EFFECT OF TEMPERATURE, C1- AND BENZATRIAZOLE,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01235

THE EFFECT OF HYDRAULIC JUMP ON THE PERFORMANCE OF A SINGLE-STAGE FLASH EVAPORATOR,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
A. H. Abdelmessih, and I. C. Hsu.
Desalination, Vol. 19, p 65-74. 1976, 10 fig, 6 ref. (California Water Resources Center Desalination Project).

Descriptors: *Desalination, *Hydraulic jump, *Flash evaporation, *Evaporators, Desalination processes.

The interaction between the hydraulic jump and the rate of flash evaporation has been investigated experimentally. The results obtained show that as the interstage temperature potential is increased, a corresponding increase in the rate of flash evaporation is noted together with variation in the characteristics of the hydraulic jump. The results also show that the rate of flashing is independent of the mass flow rate in the flash evaporator if the hydraulic jump is not changed. The analysis of the experimental results, together with photographic pictures, clearly show that the hydraulic jump region has the dominating effect on the rate of flashing and therefore, cannot be neglected in the analysis of flash evaporators. (Snyder-Calif, Davis)
W79-01238

SOLAR-ASSISTED DISTILLATION OF SEA WATER,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, and E. D. Howe.
Heliotechnique and Development, Vol. 2, p 458-482. August 1976, M. A. Kettani and J. E. Sousson, Editors. Development Analysis Associates, Inc., Cambridge, Massachusetts. Proceedings of the COMPLES International Conference, Dhahran, Saudi Arabia, November 2-6, 1975. (California Water Resources Center Desalination Project).

Descriptors: *Solar distillation, *Desalination, *Desalination plants, Thin films, Energy, Water supply, Sea water, Evaporators.

A preliminary design of a plant to produce 40 m3/day of fresh water is given. The plant consists of a 15-effect rotating evaporator, together with the solar collector, water storage tanks, flash tank and various pumps and controls. Steam is condensed on the inside flat surfaces of narrow cylindrical enclosures, and latent heat is used to partially evaporate sea water from thin films on the other faces. The electrical energy required is of the order of 5 kWh/m3 of water produced. Cost estimates indicate that water could be produced more cheaply by the proposed plant than by basin-type distillers. (Snyder-Calif, Davis)
W79-01239

INVESTIGATION OF HEAT TRANSFER COEFFICIENTS OF WORKING FLUIDS IN GEOTHERMAL POWER CYCLES,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 4B.
W79-01279

CATION-EXCHANGE COLUMN BEHAVIOR IN A DESALINATION PROCESS WITH REGENERANT RECOVERY,
California Univ., Berkeley. Dept. of Chemical Engineering.
D. J. Vermeer, S. Lynn, and T. Vermeulen.
I&EC Process Design & Developmet, Vol. 14 P 90-297, July 1975. 17 fig, 4 tab, 5 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: *Desalination processes, *Brackish water, *Ion exchange, Chemical reactions, *Cation exchange.

Weak-base and strong-acid ion exchangers for desalting of brackish water can be regenerated with aquious ammonia and hydrochloric acid. A new processing technique would supply these chemicals by treating recycled ammonium chloride with magnesium oxide or hydrocxy chloride to release ammonia and subsequently calcining magnesium chloride at tempertures below 500C to produce a bse and hydrogen chloride. The net result is a process for deslting brackish water by ion exchange which requires and input only of thermal energy. Performance characteristics of the selected cation exchange, polystyrenesulfonic acid 12% cross-linked, are reported dith respect to brackish water feed at around 0.1 N regenerant HC1 at 5 N. Equilibira for the system H+-Na+-Ca2+ are given, along with data on resin shrinkage and Donnan uptake at 5f N, and are Attributed to nonideal behavior in both coexisting phases. In column runs measuring effluent-concentration history, failure to observe sharpening of breakthrough at lower flow rates during regeneration is attributed to 'fingering' flow caused by short-range reversal of the otherwise stable density gradient. Significace of the equilibrium and breakthrough data for process design is discussed. (Snyder-Calif, Davis)
W79-01280

ELECTROCHEMICAL BEHAVIOR OF ROTATING IRON DISKS EFFECT OF FE(111),
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01281

CYCLIC PERFORMANCE OF LAYERED BEDS FOR BINARY ION EXCHANGE,
California Univ., Berkeley. Dept. of Chemical Engineering.
G. Klein, and T. Vermeulen.
AIChE Symposium Series, Vol 71, No 152, p 69-76, 1975. 10 fig, 4 ref. (California Water Resources Center Project UCAL-WRC-S-172).

Descriptors: *Ion exchange, Chemical reactions, *Resins, Exchangers, *Layered beds, Performance.

Layered beds involve the sequential use of a resin favorable to regeneration and a resin favorable to exhaustion, operated cyclically, with the exhaustion and regeneration flows occurring in opposite directions. A local equilibrium analysis is provided, which gives ideal efficiencies through either graphical or numerical calculations. Also, the results of such calculations are presented in graphs which facilitate the selection of resins and of the proportions in which they should be used. (Snyder-Calif, Davis)
W79-01339

MIXED-BED ION EXCHANGE DESALTING BY THE CALCIUM HYDROXIDE PROCESS,
California Univ., Berkeley. Dept. of Chemical Engineering.
V. W. Page, G. Klein, F. M. Golden, and T. Vermeulen.
AIChE Symposium Series, Vol 71, No 132, p 121-127, 1975, 7 fig, 1 tab, 13 ref. (California Water Resources Center Project UCAL-WRC-S-172).

Descriptors: *Desalination processes, *Model studies, *Calcium hydroxide, *Ion exchange, Saline water.

A model theoretical study of a mixed-bed ion exchange system is described. A desalination step, consisting of a saline water feed to the mixed bed in the calcium and hydroxide forms, is followed by a two-step regeneration scheme which utilizes a slurry of calcium hydroxide in freshwater. The calcium hydroxide can then be filtered from the product and regenerant streams for reuse. Whether the desalination step produces more or less water than the regeneration scheme uses must be determined for process evaluation. (Snyder-Calif, Davis)
W79-01340

POLARIZATION AT MEMBRANE/SOLUTION INTERFACES,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler, J. Leibovitz, and J. Sinkovic.
Proceedings, Study Week on Biological and Artificial Membranes and Desalination of Water, April 14-19, 1975. Elsevier Scientific Publishing Co., New York, 1976, p 1-20. S-113.

Descriptors: *Electrodialysis, *Reverse osmosis, Desalination processes, *Polarization, Membrane processes.

A summary and status report are presented of the study of interfacial polarization in electrodialysis at the Sea Water Conversion Laboratory, University of California - Berkeley. The processes studied in the membrane research group of this Laboratory are electrodialysis (in which ions and water are transported across membranes under the influence of electrical forces), and hyperfiltration (reverse osmosis) in which the driving force is pressure. The experimental results described were obtained under realistic conditions of solution flow (i.e. actual plant hydrodynamics), except experiments with laser interferometry, which were performed in a small, bench-scale cell. (Snyder-Calif, Davis)
W79-01342

THE ROLE OF MEMBRANE METHODS IN THE DESALINATION OF BRACKISH WATER,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
Proceedings, International Symposium on Brackish Water as a Factor in Development, January 1975, Ben Gurion Univ. of the Negev, Beer-Sheva, p 221-230, 1977. 7 fig, 7 ref.

Descriptors: *Mass transfer, *Reverse osmosis, *Electrodialysis, *Desalination, *Brackish water, *Membrane processes.

Achieving the optimal production rate of membrane units for desalination depends critically on the reduction of mass-transfer bottlenecks, termed 'polarization,' at the membrane-solution interfaces. Research on polarization phenomena in hyperfiltration (reverse osmosis) and electrodialysis is reported. (Snyder-Calif, Davis)
W79-01343

INDUCED CRYSTALLIZATION OF LARGE FREE ICE CRYSTALS IN SLOWLY FLOWING BRINE,
Monsanto Research Corp., Dayton, OH.
E. F. Janzow, and B. T. Chao.
Desalination, Vol 12, 1973, p 163-175. 6 fig, 11 ref. OWRT S-007-ILL(1).

Descriptors: *Crystallization, *Desalination, Separation techniques, Ice-brine system, *Freezing processes, Brines, Ice crystals, Ice formation.

A new crystallization phenomenon of ice from brine is described. Within a relatively narrow range of subcooled brime temperatures, plate-like free ice crystals of up to several inches in length were formed in the bulk of slowly traversing brine simultaneously with the growth of dendritic ice on a cold surface. System conditions under which the phenomenon would occur were determined for brines contaning 1,700 to 30,000 ppm sodium chloride and traversing at 0.009 ft/sec. The salt concentration of melted samples of ice produced in this manner, with and without brine removal treatment is given.
W79-01429

3B. Water Yield Improvement

RANDOMIZED CLOUD SEEDING IN THE SAN JUAN MOUNTAINS, COLORADO,
Aerometric Research Inc., Goleta, CA.
R. D. Elliott, R. W. Shaffer, A. Court, and J. F. Hannaford.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1298-1318, September 1978. 12 fig, 7 tab, 14 ref.

Descriptors: *Cloud seeding, *Weather modification, *Snowfall, *Colorado, *Colorado River Basin, Silver iodide, Precipitation(Atmospheric), Mountains, Model studies, Mathematical models, Networks, Precipitation gages, Runoff, Water resources, Snowpacks, Snowmelt, On-site investigations, Meteorology, *San Juan Mountains(Colo).

A five-year, randomized cloud seeding program conducted in the San Juan Mountains of southwestern Colorado by the Bureau of Reclamation was completed in April 1975. The test design included randomization of the seeding by 24 h experimental days, and other features such as operation only during suitable cloud and wind conditions, and suspension to avoid adverse effects on the public and environment. Previous experimentation near Climax, Colorado, during the 1960's had identified conditions under which clouds seeded with silver iodide would produce more snow than similar, untreated clouds. The purpose of the Colorado River Basin Pilot Project was to determine whether the experimental procedure applied at Climax would be effective in an operational mode. The objectives were twofold: (1) to test the physical concepts of weather modification potential, and (2) to test the practical weather modification potential for an operational technology in the continental weather systems that bring snow to the San Juans. A formal statistical analysis based on precipitation data for 71 experimental treated days and 76 experimental control days found no significant difference between precipitation, gage-by-gage, on seeded and unseeded days, even after deletion of 22 control days suspected of contamination by

previous seeding. An a posteriori analysis, based on 6 h time blocks (in place of the 24 h day called for in the experimental design), indicated that positive seeding effects may have been achieved during periods of warm cloud-top temperatures, as expected from the Climax experiment. These positive effects may have been overbalanced in the experiment by decreases in snowfall due to seeding unfavorable cloud types. The results of the a posteriori analysis suggested that an operational seeding program, flawlessly carried out with perfect forecasts and no periods of suspension, could increase 15 October-15 May precipitation by 10-12% in various portions of the drainage basin. The resulting average precipitation increase during the snow accumulation season, put into a hydrologic streamflow model developed as part of the evaluation, yields a potential increase in annual runoff of the San Juan River of 197,000,000 cu m. In the Rio Grande Basin, on the downwind side of the crest, the potential increase in annual runoff is 186,000,000 cu m. (Sims-ISWS)
W79-01035

HEAT AND THRUST REQUIREMENTS OF A THERMAL FOG DISPERSAL SYSTEM,
Air Force Geophysics Lab., Hanscom AFB, MA.
B. A. Kunkel.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 112, Price codes: A03 in paper copy, A01 in microfiche. Report AFCRL-TR-75-0472, September 5, 1975. 43 p, 13 fig, 10 tab, 8 ref.

Descriptors: *Weather modification, *Fog, *California, *On-site investigations, Equipment, Testing procedures, Testing, On-site tests, Winds, Weather, Airports, Heat, Meteorology, *Irvine(Calif), Fog modification, *Thermal fog dispersal.

Field tests were conducted with a subscale momentum/heat system to determine the optimum heat and thrust requirements and combustor positions for a full-scale thermal fog dispersal system. The site, located in Irvine, California, was laid out on a 1/6 scale. The Froude number scaling law was used to scale up to full-scale. An array of 65 thermistors and 6 wind sensors were located in the target area over a simulated runway. Wind and temperature sensors also were located outside of the target area to prodvide background measurements during the tests. Tests were conducted at night, in clear air, during calm conditions. Both momentum ad passive heat systems were evaluated in terms of heat and thrust requirements for different wind conditions. A single line momentum/heat system requires 5 to 10 times as much thrust as does a two-side-of-the-runway system. A passive system requires anywhere from 130-470% more heat output than does a momentum system. The appropriate system for a particular airfield can be determined only after a cost analysis has been made of the various systems and a wind study has been made of the particular airfield. (Sims-ISWS)
W79-01058

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO
B. C. Farhar, and R. Rinkle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 246, Price codes: A08 in paper copy, A01 in microfiche. Final Report, December 1976. 158 p, 1 fig, 84 tab, 44 ref, 1 append. Bur. Rec. 6-07-DR-20090.

Descriptors: *Weather modification, *Snowfall, *Social impact, *Surveys, *California, Social aspects, Snow, Water resources, Water resources development, Cloud seeding, Effects, Meteorology, *Sierra Mountains(Calif)

This report presented a descriptive analysis of the societal response to a proposed snowpack augmentation pilot project in California. A citizen survey (N = 200) obtained data on opinions about cloud seeding in comparison to other water-augmenting technologies, knowledge of and general attitudes toward weather modification, belief in the technology's effectiveness, and preferred decision-making methods. A related community-level study focused on factors hypothesized to be associated with a community's wilingness to experience a cloud seeding project. Data were presented on such variables as weather-related activities of the area, heterogeneity of weather needs, economic well-being, perception of water needs, history of public response to weather modification in the area, media position, compensatory arrangements, and preferred decision-making procedures. The conclusion reached was that the proposed project likely would find social acceptance, especially if certain identified problem areas could be resolved; and recommendations concerning these problems were offered. (Sims-ISWS)
W79-01063

AN ENERGY BUDGET ANALYSIS OF EVAPOTRANSPIRATION FROM SALTCEDAR,
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. W. Gay, T. W. Sammis, and J. Ben-Asher.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, Proceedings of 1976 meetings American Water Resources Assn. and Arizona Acadamy of Science April 29- May 1, 1976, Tucson, Arizona, p. 181-187 (1976) (California Water Resources Center Project. OWRT C-6030(No. 5735)(1).

Descriptors: *Evapotranspiration, *Energy budget(Tamarisk), *Tamarisk, *Phreatophytes, Semiarid climates, *Rio Grande River(N Mex), *New Mexico, Lysimeters, Energy loss, Semi-arid lands.

Energy budget evaluations of evapotranspiration from saltcedar were carried out on the flood plain of the Rio Grade River, near Bernardo, New Mexico. The site was adjacent to the Bureau of Reclamation's lysimeter study of water use by saltcedar. The energy budget for the cloudless day of June 14,1975, revealed that energy gains from net radiation totaled 432 cal/cm2, while energy losses (in cal/cm2), were 14 to stored energy, 31 to convection, and 387 to evapotranspiration (ET). The energy loss to ET is equivalent to the latent energy contained in about 6.5 mm of water. The energy budget values are reasononable for a phreatophyte community in 2 a semi-arid environment. The latent energy loss compares favorably with 401 cal/cm2 measured by three lysimeters, although there were discrepancies in timing and amounts of loss among the individual lysimeters. The mean canopy diffusion resistance was 1.90 sec/cm over a 10-hour daytime period on June 14. The mean resistance was combined with vapor pressure deficit to predict lysimeter ET on three subsequent days. The agreement was within 12 percent, which suggests that diffusion resistance may be useful for simple ET predictions. (Snyder - Calif, Davis).
W79-01231

3C. Use Of Water Of Impaired Quality

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
H. K. Bishop, and J. R. Bricarello.
Journal of Petroleum Technology, Vol. 30, p 1240-1242, September, 1978. 1 fig, 1 tab, 10 ref.

Descriptors: *Thermal powerplants, *Geothermal studies, *Scaling, *Corrosion, Brines, Steam.

The San Diego Gas and Electric Co./U.S.D.O.E. Geothermal Loop Experiment Facility (GLEF) near Niland, California uses a high salinity geothermal fluid in a four-stage binary system with a turbine generator. This facility will become a 10 Mw power plant. The GLEF operates in three modes: (1) cascade mode, where condensed steam from the preceding stage is added to the next stage; (2) condensate reinjection mode, when the condensate from all stages is collected and injected in the last stage; and (3) the non-injection mode, where no condensed geothermal steam is injected, but instead is used as cooling water. Scale is deposited on pipe and vessel surfaces and the brine is cooled during the heat extraction process. Scale composition will vary from a lead-iron-silica mixture in the initial stage to s silica gel in the final stage. Recombining condensed steam with brine causes deposition of calcite scale due to the higher pH of the steam. Scale was removed using as acid-based softening solution followed by high pressure water. Only light to moderate corrosion was seen on mild steel vessels and lines contacting the geothermal brine due to the reducing nature of the brine and the protective effect in the scale. (Purdin-NWWA)
W79-01106

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01132

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
R. J. Hanks, T. E. Sullivan, and V. E. Hunsaker.
Soil Science Society of America Journal, Vol. 41, No. 3, p 606-610, May-June 1977. 5 fig, 6 tab, 9 ref. OWRT B-121-UTAH(1) and C-5189(No. 4233)(1), 14-31-0001-5120.

Descriptors: Osmotic pressure, Evapotranspiration, Soil water depletion, *Salinity, Irrigation water, *Corn(Field), *Alfalfa, Utah, Salt tolerance, *Water stress, Salt build-up, Crop production.

Yields of corn and alfalfa were determined where both salinity and water stress were imposed. Yields of corn (Zea mays L.) at Logan, Utah, in 1975 were decreased by salinity or water stress (caused by low irrigation levels) in direct relation to the decrease in evapotranspiration. The decrease in evapotranspiration was caused by a decrease in soil water depletion, indicating that salinity influenced soil water availability. Corn yields at Vernal, Utah, in 1974 were decreased by salinity, but to a considerably lesser extent by low irrigation, probably because of water flow upward into the root zone from a water table. Alfalfa (Medicago sativa L.) yields at Vernal in 1974 were not decreased by salinity or by low irrigation rates, because of water supplied by a water table and used by roots below the zone of salinity.
W79-01136

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 5B.
W79-01245

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01358

3D. Conservation In Domestic and Municipal Use

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,

Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01375

3E. Conservation In Industry

WASTEWATER PROBLEMS IN THE FOOD PROCESSING INDUSTRY IN THE LIGHT OF MODERN WATER MANAGEMENT (AZ ELELMISZERIPAR SZENNYVIZ-PROBLEMAI A KORSZERU VIZGAZDALKODAS TUKREBEN),
For primary bibliographic entry see Field 5D.
W79-01071

WASTEWATER TREATMENT IN THE SUGAR INDUSTRY (II) (ABWASSERAUFBEREITUNG DER ZUCKERWARENINDUSTRIE (II)).
For primary bibliographic entry see Field 5D.
W79-01072

ADDITION OF POTATO PROTEIN RECOVERED FROM POTATO STARCH FACTORY WASTE EFFLUENTS FOR BREAD,
For primary bibliographic entry see Field 5E.
W79-01073

PREPARATION OF COPPER PRECIPITATE FOR ELECTROLYTIC COPPER RECOVERY FROM ELECTROPLATING INDUSTRY WASTEWATER (DENKI MEKKI KOJO HAISUI KARA NO DO NO DENKAI KAISHU O MOKTEKI TO SHITA DO CHINDEN NO SEISEI HOHO),
For primary bibliographic entry see Field 5D.
W79-01076

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
J. C. Anderson, and J. E. Keith.
Natural Resources Journal, Vol 17, No 2, p 157-67, April, 1977.

Descriptors: *Comprehensive planning, *Energy, *Colorado River Basin, *Regional development, Water conservation, Water allocation(Policy), Competing uses, Economics, Water demand, Preferences(Water rights), Regional analysis, Water consumption.

There are four components to the argument that water will restrict development of energy resources in the Colorado River Basin: (1) the required maintenance of streamflow in local reaches of the river; (2) the required maintenance of water quality in local reaches; (3) shortage of water in the whole river system; and (4) water quality problems in the lower Colorado River. Considerable effort must be spent to develop a project, both in determining the physical and economic feasibility of new water uses, and in examining the legal institutional framework of governmental entities in the Basin. The concept of beneficial use is fundamental in the West, and certain appropriation rights and preferences in use have developed. These provisions impose problems to energy developers because of general low preference in the water rights law and provisions requiring early application to achieve beneficial use. The long-range committments necessary to most energy projects are troublesome to state water officers. Economic considerations are also important. The increased cost of water would create a strong impetus to transfer water from agriculture to other uses. Additionally, greater upstream diversions would increase the salt load, and impose greater damages downstream. (Rule-Florida)
W79-01167

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W79-01194

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01230

RECOVERY AND REUSE OF PAINT SOLIDS FROM WASTE WATER,
Drew Chemical Corp., Booton, NJ. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01391

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01396

METHOD FOR REMOVING OF MULTIVALENT HEAVY METALS FROM METAL PLATING WASTE EFFLUENTS,
Purdue Research Foundation, Lafayette, IN. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01415

CONFERENCE PROCEEDINGS - A CRITICAL ECONOMIC BALANCE, WATER - LAND - ENERGY - PEOPLE - HELD AT COLORADO STATE UNIVERSITY, PINGREE PARK CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
For primary bibliographic entry see Field 6B.
W79-01478

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W79-01482

COAL DEVELOPMENT AND RECLAMATION - PLANNING AND CONSERVATION,
Grace (W. R.) and Co., Dallas, TX. Mining Div.
For primary bibliographic entry see Field 6B.
W79-01489

CRITIQUE AND CHALLENGES,
Energy Research and Development Administration, San Francisco, CA. Consumer Affairs. CA.
For primary bibliographic entry see Field 6B.
W79-01490

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W79-01492

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 6B.
W79-01500

3F. Conservation In Agriculture

THE EFFECT OF DIRUNAL VARIATION IN LIGHT AND TEMPERATURE ON THE ACETYLENE REDUCTION ACTIVITY (N2 FIXATION) OF SUBTERRANEAN CLOVER,
California Univ., Davis Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 2I.
W79-01092

RELATION OF WATER ABSORPTION TO DURATION OF APPLICATION IN FURROW IRRIGATION,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-288 654, Price codes: A03 in paper copy, A01 in microfiche. Mississippi Water Resources Research Institute Report, October 1978. 30 p 9 fig 7 tab, 5 ref. OWRT-A-113-MISS(1), 14-34-0001-8026.

Descriptors: *Soils, Soil moisture, *Application rates, *Absorption, *Soil water movement, Duration of application, Wetted cross section.

This study sought to relate the rate of absorption and depth of penetration of water for several durations of application and soil types with a constant head supply. The study utilized moveable, metal panels that were formed into a bottomless container 1.25 ft deep, 1 ft wide, and 50 ft long and filled with dry soil by a standard method. The soils were Marietta fine sandy loam and Ruston sandy loam. A V-shaped channel 9 inches wide and 2 inches deep was formed to 0.002 slope. Initial soil moisture condition was determined at 4.5 ft intervals. A constant flow rate was admitted to the channel. The rate of advance was monitored and the flow terminated at a predetermined time interval. Soil moisture and bulk density were determined. The wetted cross section of the soil at each station was observed and measured. Both soils had high absorptive rates. Depth of penetration and width of the wetted cross section increased with duration of flow. Upstream from the point of advance of water in the channel at the time of cessation of channel inflow, there was very little variation in the visible wetted cross section and the amount of soil moisture; however, downstream from this point, there was a rapid decrease in moisture. The results are depicted in graphs and tables.
W79-01094

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 3C.
W79-01136

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-01137

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: I. NITRATE,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
V. Balasubramanian, Y. Kanehiro, P. S. C. Rao, and R. E. Green.
J Environ Qual 2(3), p 359-362, 1973

Descriptors: *Aggregated oxisol, Ananas-comosus, *Fertilizers, *Flooding(Intermittent), Irrigation, *Nitrates, Oxisol, Saccharum-officinarum, Solutes, Water pollution, Hawaii.

Movement of applied nitrate (a concentrated solution sprayed uniformly over the soil surface) under intermittent flooding was investigated in Molokai silty clay (Typic Torrox), an important soil for sugarcane (Saccharum officinarum L.) and pineapple (Ananas comosus) production in Hawaii. Nitrate distribution in the profile was characterized under an extended irrigation scheme by in situ sampling of soil solutions with suction probes 1 wk after each water application. The nitrate peak moved only 1/3 as far as would have been predicted by a piston displacement model. Equilibration of applied nitrate solution with the aggregated surface soil for beta wk prior to flood irrigation further retarded nitrate leaching. Apparently, equilibration involved bulk flow and diffusion of nitrate into aggregate micropores where the solute was less susceptible to transport in water being conducted mostly in the macropores during and soon after irrigation. Prediction of nitrate distribution based on dispersion (diffusion plus convection) equation approximated experimental results for successive irrigations reasonably well when equation parameters were obtained by fitting one set of experimental data. The drawback of this theoretical model is discussed.--Copyright 1974, Biological Abstracts, Inc.
W79-01360

WATER CONDUIT,
G. Gilead.
U.S. Patent No. 4,095,750, 4 op, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1022, June 20, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Conduits, Pipes, Drip irrigation.

A water conduit of flexible material serves as an irrigation device or as a drainage pipe. At regular or irregular distance from one another cuts are made in the wall of the conduit resulting in tongue like portions which adhere to the wall of the conduit along an uncut portion. These tongues are movable out of the plane of the wall and have an outer surface which is smaller in area than the inner surface. If used as an irrigation device, the hose or conduit is connected to a supply of water which flows under a certain pressure. Under the pressure the tongues will be pressed upwardly making the conduit tight around its circumference, except at the nick through which water can trickle or drip. The tongues can be of any configuration but in all cases the tongues adhere to the wall of the hose by an uncut web. (Sinha-OEIS)
W79-01390

GUIDANCE CONTROL SYSTEM FOR SELF-PROPELLED MOBILE SPRINKLER IRRIGATION SYSTEMS,
D. A. Cortopassi.
U.S. Patent No. 4,099,669, 6 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 589, July 11, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Irrigation efficiency, Control systems, Application equipment, Sensors, Laser projection, Laser sensors, Self-propulsion.

A mobile sprinkler irrigation system comprises an elongate sprinkler supply pipe supported at one end by a self-propelled pace carriage and along the length by a number of spaced self-propelled follower carriages. A tower on the pace carriage supports a laser projection system that projects a laser plane parallel to and along the length of the sprinkler supply pipe. The follower carriages carry laser sensor units placed to intercept the laser plane whenever a follower carriage falls out of alignment with the pace carriage. Control circuitry operates in response to the sensors to control the propulsion wheels for the follower carriages so that the carriages follow the laser plane. Thus the follower carriages follow the path of the laser plane, as defined by the pace carriage, whether the path be curvilinear, or rectilinear. (Sinha-OEIS)
W79-01410

ADJUSTABLE HEIGHT SPRINKLER,
J. C. Cole, and E. W. Morain.
U.S. Patent No. 4,099,670, 6 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 589, July 11, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Application equipment, Irrigation practices, Irrigation efficiency.

An adjustable height sprinkler apparatus has three tubular portions telescopically received within each other. The base portion is buried vertically in the ground and connected to a source of water at the lower end, the upper end being adjacent the earth's surface. A second tubular extension member is telescopically positioned within the tubular base portion. A third tubular pop-up member is telescopically positioned in the extension number. It will slide downward by gravity and will be pushed up when water pressure is applied to the sprinkler. The pop-up member has an enlarged diameter portion at the upper end with means for attaching a sprinkler head. The object of the invention is to provide an adjustable height sprinkler including a pop-up feature so that the sprinkler may be completely hidden when not in use. (Sinha-OEIS)
W79-01411

IRRIGATING CORN AND GRAIN SORGHUM WITH LIMITED WATER,
Kansas State Univ., Manhatten.
L. R. Stone, R. E. Gwin, Jr., and M. A. Dillon.
Kansas Agricultural Experiment Station Bulletin, Keeping Up With Research No. 17, March 1975, 4 p, 1 fig, 3 tab, Kansas Water Resources Research Institute Contribution Number 160. OWRT A-069-KAN(1), 14-31-0001-5016.

Descriptors: Growth stage, Grain sorghum, Irrigation water, *Irrigation timing, *Limited irrigation, Corn(Field).

In 1974 an evaluation was made of how irrigation amount and timing influenced corn and grain sorghum yields at Manhatten and Tribune, Kansas. The resuls should help irrigators who want to use limited or less water because of limited pumping capacity, limited time, limited water supplies, increased cost of fuel for pumping, or other reasons. The corn data indicate that a single irrigation applied near tasseling or at early skilled increased yields greatly over one irrigation at blister stage or no in-season irrigation. Due to grain sorghum's drought resistance, and timely rainfall, no definite trend between irrigation timing and grain sorghum yield was determined in 1974. Limited in-season irrigation is most practical in soils that contain nothing to restrict extensive root development and that have large water-holding capacity, and if a moderate to large amount of available water is stored before planting.
W79-01425

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01047

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2A.
W79-01062

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-01137

RIPARIAN RIGHTS UNDER THE TEXAS WATER RIGHTS ADJUDICATION ACT - A CONSTITUTION ANALYSIS,
For primary bibliographic entry see Field 6E.
W79-01140

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
For primary bibliographic entry see Field 6F.
W79-01148

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01193

FRESH-WATER WEEDS ARE A RESOURCE,
Rothamstead Experimental Station, Harpenden, (England).
For primary bibliographic entry see Field 5C.
W79-01197

AQUATIC WEED MANAGEMENT: SOME PROSPECTS FOR THE SUDAN AND THE NILE BASIN, REPORT OF A WORKSHOP HELD AT KHARTOUM, SUDAN ON 24-29 NOVEMBER 1975.
Agricultural Research Council, Khartoum (Sudan).
For primary bibliographic entry see Field 5G.
W79-01205

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
K. K. Srivastava, S. D. S. Abbi, and B. R. Loe.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 28, No. 4, p 507-514, October 1977. 8 fig, 3 tab, 4 ref.

Descriptors: *Runoff forecasting, *Water balance, *Watersheds(Basins), Runoff, Dams, Soil moisture, Estimating, Meteorological data, Moisture deficit, Irrigation, Monsoons, Foreign countries, Foreign research, *India, *Sutlej Catchment(India), *Bhakra Dam(India), *Thornthwaite method.

An estimate was presented of the water balance by the Thornthwaite method for the lower Sutlej catchment between Rampur and the Bhakra Dam site. Maps showing the monthly water deficit, water surplus, soil moisture utilization, and soil moisture recharge for the period 1964-68 were prepared. Annual runoff in the Sutlej River was estimated on the basis of the water balance parameters for the same period. A year-to-year analysis

of the data showed that March to June is the period when the basin falls short of the potential water needs for crops and vegetation. The post-monsoon period, October and November, also is prone to water deficit. To some extent, January and February also are months of short water supply, except in years when appreciable amounts of precipitation occur in the basin during December, January, and February. The monsoon months of July, August, and September have sufficient water surplus for storage and runoff. The maximum water deficit occurs in May. (Roberts-ISWS)
W79-01257

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

SIMPLIFIED ROUTING THROUGH RESERVOIR,
Federal Energy Regulatory Commission, Washington, DC.
D. S. Tarnay.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 65-74, October 1977.

Descriptors: *Flood routing, *Reservoirs, *Hydrograph analysis, *Approximation method, Analytical techniques, Theoretical analysis, Analysis, Hydrographs, Methodology, Floods.

In working with extreme floods, the designer of a new dam, or the engineer checking the stability and safety of an existing one, probably would welcome a simplified flood routing model. The model may help to determine quickly the routed peak of an extreme or design flood in order to see if the routed flood can or cannot be a significant factor in reducing the peak flood. The simplified routing method is a hydrologic routing of a non-uniform, unsteady flow, and may be used only for preliminary determination of the outflow peak. It cannot replace the more accurate routing models. The simplified routing procedure, when possible, is based upon approximating the recorded inflow hydrograph by a triangle or trapezoid and having a reservoir elevation-storage curve. The approximated inflow hydrograph permits the normal routing procedures to be reduced to an algebraic equations. The simplified method of routing can be adapted best if the volume of the available pondage or surcharge ad the volume of flood have a ratio between 0.25-0.75. (See also W79-01262) (Humphreys-ISWS)
W79-01266

THE DEVELOPMENT AND TESTING OF A DAM-BREAK FLOOD FORECASTING MODEL,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
For primary bibliographic entry see Field 8B.
W79-01270

CALCULATING AND ROUTING THE TETON DAM-BREAK FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-01271

QUALITATIVE COMPARISON OF THREE DAM BREAK ROUTING MODELS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 8B.
W79-01273

DAM-BREAK FLOOD WAVE COMPUTATION BY METHOD OF CHARACTERISTICS AND LINEARIZED IMPLICIT SCHEMES,
Geological Survey, NSTL Station, MS. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 8B.
W79-01274

DAM BREAK FLOOD WAVE ANALYSIS: PROBLEMS, PITFALLS, AND PARTIAL SOLUTIONS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 8B.
W79-01276

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 8B.
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 8B.
W79-01278

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W79-01335

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
H. J. Redmond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 921, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, May 1977. 78 p, 6 fig, 8 tab, 27 ref, 3 append. OWRT A-040-LA(1), 14-34-0001-7040.

Descriptors: Risks, Disasters Dam Failure, Disaster planning, Flood control, Navigation, Water supply, Diversion, Water quality, *Louisiana, *Mississippi River, *Atchafalaya Basin Floodway, *Old River Control Structure.

The Old River Control Structure (ORCS) controls diversion of water from the Mississippi River to the Atchafalaya Basin. If diversion were uncontrolled, the Atchafalaya would probably capture the greater portion of the Mississippi's flow. Reduced flow in the Lower Mississippi River would adversely affect water quality in the Mississippi River below Old River in that the water adversely affect water quality in the Mississippi River below Old River in that the water in the channel would be increasingly affected by intrusion of salt water from the Gulf during low-flow periods. Presently (1977) the Lower Mississippi River provides 65% of the water pumped for industrial and thermoelectric uses in Louisiana and almost one-half the water used for public supply. About 6.8 billion gallons per day were withdrawn from the Mississippi River below Old River in 1975. Ground water and streams other than the Mississippi are potential supplemental or replacement fresh water sources. Total potential ground water yield in southeastern Louisiana is estimated at 1300 MGD. The Pearl River is a possible alternate source of Mississippi River water users on the left descending river bank from St. Charles Parish downstream. An estimated minimum 270 MDG of fresh water would be required by industries, power plants and for municipal supply in this area to replace the present supply. Pearl River stream flow data indicate 270 MGD could be supplied without reducing the river's minimum flow 92% of the time. Water from the Pearl could replace ground water by recharging the aquifers when Pearl River flows exceed that required to provide the 270 MGD requirement. A crude cost analysis indicates 270 MGD of water could be delivered to water users at a cost of approximately $.22/1000 gallons.
W79-01336

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
J. H. Coffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 944, Price codes: A09 in paper copy, A01 in microfiche. MS Thesis, June 1977. 166 p, 17 fig, 12 tab, 63 ref, 2 append. OWRT B-037-IDA(3).

Descriptors: *Idaho, *Snake River(Ida), *Hells Canyon, *Multiple-purpose reservoirs, *Dams, *Water utilization, *Hydroelectric power, *Model studies, Competing uses, Flow control, Water storage, Recreation, Project feasibility, Surveys, Water resources development, Mathematical models, Reservoirs, Project planning, Water demand, Irrigation, Human population.

The problems associated with water flow and operation of dams in the Hells Canyon area of the Snake River in Idaho were surveyed and possible solutions were examined. Conflicts between Idaho Power Company projects and plans for the Hells Canyon Recreation Area were reviewed with respect to timing and quantity of water needs. Also, population growth and irrigation development were assessed as future complicating factors. In view of agricultural and recreational uses increasing and the inflexibility of the Idaho Power Company's demands, some water shortages in the future are indicated. An analysis was performed on the possibility of building a reregulating dam below Hells Canyon dam; however, although physically feasible, such a dam has little political or social support and little chance of success. Finally, a simplified model was constructed to operate Brownlee storage reservoir and compute the electric energy that would be generated under various conditions. For example, it was determined that a drop of 23% in energy production was possible if streamflows dropped to the predicted level and if the 5000 cfs minimum release was maintained. Raising the minimum flow requirement had only a slight effect on total energy production. Suggestions for future studies include: the effect on total peaking production of varying parameters such as flow, inflow level, and rule curve level; inclusion in the computer program of hydrologic data for each year, such as snow pack information and precipitation, and an analysis to include critical combinations of hydrologic condition and demand characteristics. (Majtenji-IPA)
W79-01359

QUANTIFICATION OF RECREATIONAL USE OF THE CORALVILLE RESERVOIR,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 6B.
W79-01361

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE ROCK-FOX RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-01366

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01368

Group 4A—Control Of Water On The Surface

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
G. P. Williams.
Circular 781, 1978. 48 p, 29 fig, 5 tab, 13 ref.

Descriptors: *Channel morphology, *Streamflow, *Discharge(Water), *Sedimentation, Braiding, Reach(Streams), Streambeds, Vegetation, Environmental effect, *Nebraska, *North Platte River(Neb), Platte River, *Channel shrinkage.

Since the latter part of the 19th century, channels of North Platte and Platte Rivers in western and central Nebraska have changed considerably. In the 365-km reach from Minatare to Overton, the channel by 2969 ws only about 0.1-0.2 as wide in 1865. The 1969 channel for this reach was less braided and slightly more sinuous than the 1938 channel. (No data are available for braiding and sinuosity prior to 1938.) From Overton to lGrand Island the 1969 channel was about o.6-0.7 as wide as in 1865, and various changes in braiding and sinuosity took place between 1938 and 1969. The decreases in channel width are related to decreases in water discharge. Such flow reductions have resulted primarily from regulating effects of major upstream dams and greater use of the river water. Much of the former river channel is now overgrown with vegetation. (Woodard-USGS)
W79-01380

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div
R. C. Heath
In: Proceedings of Soil Moisture-Site Productivity Symposium, held in Myrtle Beach, South Carolina, November 1-3, 1977, p 250-261, 1977. 6 fig, 3 ref.

Descriptors: *Coastal marshes, *Drainage effects, *Aquatic habitats, *Estuaries, *Saline water-freshwater interfaces, Swamps, Canals, Hydrology, Shrimp, Oysters, Ecosystems, Land clearing, Evaluation, *North Carolina, Hyde County(NC), Tyrrell County(NC), Dare County(NC), Washington Counrty(NC)

Dense artificial drainage networks, consisting of about 20 miles of channel per square mile of area, presently under construction in the outer coastal zone of North Carolina, are having a significant impact on adjoining estuarines. The primary effect is the discharge of large volumes of freshwater from main canals to natural streams and bays which serve as vital links in the life cycles of marine organisms. The increased freshwater discharge decreases salinities in those areas, thus forcing marine organisms into areas less favorable to their survival. Possible solutions to the problem include moving outfall points or storing water during peak runoff periods. (Woodard-USGS)
W79-01385

REVIEW OF R & D ON WATER HYACINTH UTILIZATION IN THE PHILIPPINE REPUBLIC,
Battelle Columbus Lab., OH.
J. L. Otis, and M. E. D. Hillman.
Available from the National Technical Information Service, Springfield, VA 22161 as N77 25005, Price codes: A03 in paper copy, A01 in microfiche. Report No. BCL-OA-TFR-76-9, November 1976. 36 p, 4 fig, 7 tab, 2 append. Task 1, NASw-2800.

Descriptors: *Water hyacinth, *Beneficial use, *Defibering, *Monsod system, *Aquatic plants, Philippines, Eichhornia crassipes, Research and development, Harvesting, Feeds, Foods, Proteins, Pulp and paper industry, Fiber crops, Fibers(Plant), Methodology, Technology, Pesticides.

A system for defibering water hyacinth (Eichhornia crassipes) and using the plant for fiber, protein supplements, animal feeds, human foods, pesticides, vitamins and minerals, and medicines, developed by Filipino inventor Godofredo Monsod is evaluated. The investigation was severely limited by Monsod's refusal to permit viewing of actual operations and this report is based primarily on interviews, observations in some research facilities, a film of the defibering operation, and some data. While Monsod's cottage industry approach would not be particularly suited to industrialized countries, significant exploratory research nevertheless has been conducted into applications of hyacinth products, and the feasibility of defibering has apparently been demonstrated. Some results should be reconfirmed prior to major research and development commitments. The defibering operation uses a modified corn-milling machine with special processing techniques. Monsod claims 50-70% fiber recovery, or 80% with the inclusion of large quantities of parenchyma cells. Separation of the highly fibrous portion of the plant would probably eliminate several problems which have occurred when the whole plant has been used as a feedstock in pulp production, and defibering would improve the digestibility of the remainder as an animal feed protein supplement. Experimental hyacinth-based particle boards show promise. Little information was available on harvesting, drying, or aging. (Lynch-Wisconsin)
W79-01470

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W79-01473

4B. Groundwater Management

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 8B.
W79-01053

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources
For primary bibliographic entry see Field 5B.
W79-01090

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
For primary bibliographic entry see Field 7B.
W79-01101

A WATER WELL EVALUATION SYSTEM,
For primary bibliographic entry see Field 8B.
W79-01102

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 16, No. 5, p 318-321, September-October, 1978. 7 fig, 7 ref.

Descriptors: *Water management(Applied), *Aquifer management, *Storage capacity, *Water quality, Drawdown, Irrigation practices, Optimization.

Aquifers are essentially underground water storage reservoirs. Five properties dictate how aquifers should be used in water management. These are: (1) the size or storage volume; (2) the 'response time' or the time it takes for ground water to move out of the reservoir; (3) the quality of the ground water; (4) the ecological impacts when used; and (5) the cost of operation and maintenance involved in developing them. Because of the long response time of aquifers; the rate at which they fill up does not fluctuate as widely as stream flow. However, we are not making optimum use of the storage capacity of aquifers by not pumping enough water. What is not used eventually is lost to rivers as runoff. Ground-water laws may not allow aquifers to be drawn down optimally. Ground-water degradation due to irrigation may irreversibly destroy the aquifer. Managing ground-water quality requires regional control. A good example is the Accelerated Salt Transportation (ASTRAN) method which distributes the various available irrigation waters in such a way so that a water quality gradient is maintained between applied irrigation water and underlying ground water. Fresh water aquifers, in general, have not been used to their fullest capability and in many areas are being abused. (Purdin-NWWA)
W79-01105

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Science, London, (England).
For primary bibliographic entry see Field 8B.
W79-01107

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01108

USING LARGE DIAMETERS TO INCREASE WELL STORAGE,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W79-01109

DRILLING LARGE DIAMETER WELLS: THE PROOF IS IN THE PLANNING,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W79-01110

CITIZEN PARTICIPATION FOR SUCCESSFUL VILLAGE WATER SUPPLY,
For primary bibliographic entry see Field 6B.
W79-01112

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5B.
W79-01113

THE EXPANDING GEYSERS,
L. Quenet.
Electrical World, Vol. 189, No. 7, April 1, 1978. 6 fig.

Descriptors: *Geothermal studies, *Thermal powerplants, *Drilling, Steam, Electric power, Injection, Hydrogen sulfide, Operating costs, Hot springs.

In 1922, drillers successfully tapped pressurized, clean, dry steam in the subsurface fractures and pockets of the Geysers. However, due to technological and economic difficulties, this project was abandoned for over 30 years. In 1960, the first 11-Mw turbogenerator unit produced power. By the end of 1979, there will be 15 units generating 908 Mw and by 1989 25 units generating 2000 Mw. At the Geysers, a field is developed by drilling a cluster of wells. The well-drilling technique is similar to that of natural-gas drilling but a new technology had to be developed to deal with harder rock formations, higher temperatures, and abrasive conditions. Geothermal steam must have a temperature of 350 degrees F and a pressure of 100 psi. Generally, it cannot be transported more than one mile from its source due to temperature and pressure losses. Excess water from the cooling process is reinjected into the ground alongside the original steam wells. This avoids surface water pollution and maintains the water table. Air pollution due to hydrogen sulfide in the steam is eliminated with an iron-catalyst process. The total operating cost pe Kwhr of The Geyses is lower than that of gas/oil-burning plants, coal-fired plants, or nuclear plants. (Purdin-NWWA)
W79-01116

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
P. L. Hail.
Water and Sewage Works, Vol. 125, No. 10, p 54-55, October, 1978 1 fig.

Descriptors: *Water management(Applied), *Groundwater resources, *Water demand, Water wells, Long-term planning, Optimization, Artificial recharge, Conjunctive use, Computer models, Aquifers.

The objectives of a ground-water management program are: (1) To meet demands; (2) To optimize water resources and existing distribution systems; and (3) To develop ling-range plans. The physical limitations of the aquifer must be known to ensure a constant supply of good quality water and a reserve supply to meet peak demands or breakdowns. Many existing well fields are not operating at maximum efficiency. Well efficiency can be determined by running short pumping tests on each well and comparing the results with those of earlier tests. Encrustations of a well screen will reduce efficiency but usually can be removed by acid treatment. Long-range planning involves the prediction of demands and the development of plans to meet projections. New wells should be constructed and tested ahead of demands and brought into operation when needed. The aquifer capacity should be determined to avoid overdevelopment. Recharge areas should be constructed and tested ahead of demands and brought into operation when needed. The aquifer capacity should be determined to avoid overdevelopment. New wells should be constructed and tested ahead of demands and brought into operation when nneded. The aquifer capacity should be determined to avoid overdevelopment. Recharge areas should be located and protected from contamination hazards. Artificial recharge and conjunctive use of ground water and surface water may be necessary when demands exceed supply. The use of analog and digital computer models to evaluate well field performance will facilitate the development of management schemes. Just how accurate the models are depends on the quality of input data. (Purdin-NWWA)
W79-01117

GROUNDWATER LAW: MORE QUESTIONS THAN ANSWERS,
For primary bibliographic entry see Field 6E.
W79-01118

WELL LOGS...ARE THEY REALLY NECESSARY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7C.
W79-01119

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01132

THE LEGALIZATION OF GROUNDWATER SHORTAGE,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 6E.
W79-01142

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
For primary bibliographic entry see Field 5G.
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
For primary bibliographic entry see Field 5G.
W79-01156

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-01165

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
W. Hausz, and C. F. Meyer.
Public Utilities Fortnightly, Vol. 95, No. 9, p 34-38. April 24, 1975. OWRT C-5205(No. 4210)(3), 14-31-0001-4210.

Descriptors: *Thermal energy, *Thermal water, *Heat transmission, *Heat transfer, *Underground water storage, Pipelines, Thermodynamics, Waste heat, Heat losses, Electric powerplants, Plant efficiencies, Injection wells, Groundwater, *District heating, *Thermal energy storage, Telethermics, Efficient use of energy.

The maximum amount of heat energy that can be converted to electricity in modern power plants is approximately 40%. The remaining 60% is almost always dumped into air or water as useless low-temperature heat. High-grade heat, supplied by combustion at 3000F, is diluted with air or water so that there is little potential to get work from the low-grade heat after it has been used for space heating, hot water, and industrial process heat. Combined power and heat production is practiced, but on a limited scale. Of the 6,900 billion kilowatt-hours thermal used in the U.S. each year for low-grade heat, less than 0.5% is currently served by district heating systems. Over 4,000 billion kilowatt-hours thermal are rejected from electric utility generating stations; thus, the conservation opportunities are substantial. Coupling power and heat production requires massive storage of heat energy to bridge seasonal variations in power and heat demands. The Heat Storage Well appears to be a viable approach to storage of large amounts of heat for long periods of time, at low cost, and with low loss. Turbines running on fossil-fuel or nuclear steam supplies can be designed to exhaust at temperatures of 350F. Large amounts of water at 300-350F can be transmitted for distances of up to 100 miles, as is being done in several European countries, at costs comparable to overhead transmission of equivalent electrical energy. The cost of the Heat Storage Well is estimated to be $3 to $8 per thermal kilowat, much lower than the $15 to $40 per thermal kilowatt for dry cooling towers that may be replaced. The operating (pumping power) cost of Heat Storage Wells is approximately tow cents per million Btu's stored and withdrawn.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
W. Hausz.
In: Symposium Papers - Efficient Use of Fuels in the Metallurgical Industries, Presented at III Research Institute, Chicago, Illinois. December 9-13, 1974, p 185-201, Institute of Gas Technology. Chicago, Illinois, February 1975. OWRT C-5205(No4210)(1), 14-31-0001-4210.

Descriptors: *Underground water storage, *Usable storage, *Thermal energy, *Thermal water, *Heat transmission, *Heat transfer, High temperature, Confined aquifers, Pipelines, Thermodynamics, Waste heat, Heat losses, Heat balance, Electric power plants, Plant efficiencies, Injection wells, Thermal power, Groundwater, *District heating, *Thermal energy storage, Efficient use of fuels, Telethermics.

The thermodynamic and pragmatic merits of extracting maximum work as well as heat energy are reviewed and the feasibility of achieving up to 85% efficiency with total-energy and heat-and-power utilities is examined. Extensive European use of high-temperature water (e.g., at 350 degrees F) for district heating is described. For most effective coordination of the seasonal and daily variations of demand for heat and electricity, massive low-cost storage of heat is required. Underground storage of high-temperature water in confined aquifers is proposed as a solution. Heat energy at a 24-megawatt rate (1 mgd at 350 degrees F) can be injected for 90 days and recovered during the following 90 days with an expected energy loss of about 20%. Storage cost is estimated at 10 cents per million BTU. Transmission cost via large pipes carrying high-temperature water from central stations to load centers is estimated to be less than $1/million BTU/100 miles. This is comparable to the cost when overhead electric transmission lines are used.
W79-01230

INVESTIGATION OF HEAT TRANSFER COEFFICIENTS OF WORKING FLUIDS IN GEOTHERMAL POWER CYCLES,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, and A. D. K. Laird.
Transactions, Geothermal Resources Council, Vol 2, Fig 2 p 655-657. July 1978. (California Water Resources Center Desalination Project).

Descriptors: *Heat transfer, *Geothermal studies, *Thermal water

The objective of the binary fluid experiment described is to obtain data to determine baseline heat transfer data for working fluids being considered for binary cycle systems to produce power from hot geothermal brines. These data will be used to calculate film coefficients for heating, boiling, superheating, desuperheating as well as condensation for candidate working fluids. (Snyder-Calif, Davis)
W79-01279

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
For primary bibliographic entry see Field 5F.
W79-01311

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01365

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01367

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

DIGITAL-MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER, OTTER CREEK-DRY CREEK BASIN, CORTLAND COUNTY, NEW YORK.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01377

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES.
Geological Survey, Lubbock, TX. Water Resources Div.
For primary bibliographic entry see Field 8C.
W79-01378

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-01421

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.
W79-01422

4C. Effects On Water Of Man's Non-Water Activities

CONTROLLING EROSION ALONG HIGHWAYS WITH VEGETATION OR OTHER PROTECTIVE COVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W79-01059

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-01060

EVALUATION OF DESIGN METHODS OF SUBSURFACE DRAINAGE FACILITIES FOR HIGHWAYS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
G. M. Slaughter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 364, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-PO-122, Feb. 1973. 193 p, 56 fig, 16 tab, 90 ref, 4 app.

Descriptors: *Drainage, *Subsurface drainage, *Highways, *Drainage practices, Drainage engineering, Tile drainage, Infiltration, Drains, Tile drains, Surveys, Engineering, Civil engineering, Highway drainage.

The primary purposes of this study were to evaluate the methods used by the State Highway Department of Georgia for the design of highway subsurface drainage facilities, to compare these methods with what other states are doing, and to recommend, if applicable, research projects and/or additional studies which would lead to an improvement in these methods. The study consisted mainly of a library search and the analysis of two questionnaires on subsurfce drainage. The qustionnaires were sent to the 50 State Highway Departments plus District of Columbia and Puerto Rico. What Georgia is doing in connection with subsurface drainage is in keeping (for the most part) with what other states are doing. No two states have evolved to exactly the same place in their approach to solving the problem of subsurface drainag. In general, the highway departments have not kept abreast with many of the advances in problem solving techniques for flow through porous media. Recommendations were made which outlined research projects. Basically, these recommendations amounted to better utilization of the aformentioned problem solving techniques and more effort expended in obtaining better data for design and verification of the design models. (Sims-ISWS)
W79-01061

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2I.
W79-01099

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
For primary bibliographic entry see Field 5G.
W79-01166

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6G.
W79-01220

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
K. H. Tan, and D. Thirumurthi.
American Society of Civil Engineers, Journal of the Environmental Engineering Division, Vol. 104, No. EE5, Proceedings Paper 14052, p 997-1011, October 1978. 13 fig, 3 tab, 6 ref.

Descriptors: *Construction, *Water supply, *Highways, *Canada, Deicers, Gabions, Lakes, Nutrients, Roads, Runoff, Salts, Water pollution, Water quality, Environmental effects, Environmental control, *Highway construction, Ice removal, Water-supply lakes, Soil loss.

A unique opportunity existed and was taken advantage of, in Halifax, to assess the environmental impact of highway construction on four water supply lakes (Long Lake, First Chain Lake, Second Chain Lake, and Withrod Lake), two of which were as close as 30 ft (10 m) from the proposed highway. Although the water qualities of Long and Chain Lakes have not deteriorated significantly as a result of construction, certain parameters such as conductivity, chloride, and total organic carbon have been increasing throughout the study period, indicating the increasing uses of the watersheds. The gabions, intended to be the pollution control devices, were not effective in reducing the suspended impurities in the runoff because the surface runoff bypassed the gabions in some cases, and the poor sizes of the gabion structures were too coarse to effectively filter the water in other cases. However, sand bags installed near the First Chain Lake were successful in diverting runoff from the construction site and, thus, reduced the pollution load entering that lake. (Lee-ISWS)

W79-01260

THE EFFECT OF FIRE ON SPECIES COMPOSITION IN CYPRESS DOME ECOSYSTEMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
K. C. Ewel, and W. J. Mitsch.
Florida Scientist, Vol. 41, No. 1, p 25-31, Winter, 1978. 1 fig, 1 tab, 17 ref.

Descriptors: *Swamps, *Burning, *Florida, *Cypress trees, Wetlands, Effects, Pine trees, Trees, Hardwood, Ecology.

Cypress trees were more successful than pines and hardwoods in surviving a fire which destroyed 42% of the trees in two cypress dome ecosystems. Cypress trees had comprised nearly half of the trees in the domes, which had been drained for several years. After the fires, an average of 89% of the trees were cypress, 9% were hardwoods, and 2% were pines. The majority of cypress trees burned put out adventitious branches, and some of the more severly damaged trees survived by coppicing. Greatest mortality occurred in the center of the dome where organic matter was deepest. The existence of an open central pool in many cypress domes may be, in part, the result of occasional fires. (Stihler-Mass)
W79-01292

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. at Urbana-Champaign. Dept of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 6E.
W79-01295

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6B.
W79-01353

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01385

THE IMPACT OF LOGGING ON SALMONID RESOURCES IN THE PACIFIC NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
C. J. Cederholm.
In: Twenty-Eighth Northwest Fish Culture Conference, Dec. 6-8, 1977, p 101-111, 49 ref.

Descriptors: *Salmon, *Land clearing, Land development, Land use, Large watersheds, Pacific Northwest United States, *Pacific Coast Region, Recreation, Road construction, Herbicides, Nutrients, Idaho, Alaska, Oregon, British Columbia, Washington, *Logging, *Logging practices, *Fisheries resources, Log storage, Forest canopy, Residue removal.

To the casual observer, logging and its associated disturbances must cause unquestionable damage to the fisheries resources; however, quantitative research directed toward documenting these apparent impacts under natural conditions have met with surprisingly few definitive results. Often logging effects are masked by natural climatic fluctuations, overharvest in the commercial and sport fisheries, and other man-related disturbances. Also, logging impacts can be subtle and thus difficult to detect in short-term studies using the sampling tools available to the fishery biologist today. Since the 1950's, a number of agencies throughout the Northwest have become increasingly involved with research into the negative effects of logging practices on fish and their habitats. Literature is extensive in Idaho, Alaska, Oregon, British Columbia, and Washington. Surprisingly few studies have looked at the possible beneficial effects of controlled logging, although some noted authors have mentioned this possibility. There seems to be a recent change in attitude favoring prevention through 'Best Management Practices' rather than rehabilitation after non-compliance with questionable standards. Some logging practices have been found to cause degradation to the watersheds and result in impacts to salmonid resources. For convenience, logging activities with potential to impact fisheries resources can be divided into four categories: (1) road construction and maintenance; (2) canopy and residue removal; (3) addition of chemicals including herbicides and fertilizers; and (4) log storage and transportation. (EIS-Katz)
W79-01466

4D. Watershed Protection

CONTROLLING EROSION ALONG HIGHWAYS WITH VEGETATION OR OTHER PROTECTIVE COVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
D. L. Wright, H. D. Perry, and R. E. Blaser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 093, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-VA-77-517, August 31, 1976. 79 p, 43 tab.

Descriptors: *Erosion control, *Highways, *Vegetation establishment, Erosion, Water pollution, Water pollution sources, Bank protection, Bank stability, Embankments, Soil stabilization, Grading, Mulching, Soil amendments, Vegetation, Fertilizers, Planting management, Seeds, Legumes, Agronomy.

Construction operations in highway corridors disturb the natural vegetation and land contours, causing potential erosion sites if left denuded. Minimizing erosion on these areas is based on the principles of maximizing water infiltration and reducing water runoff obtainable with rough and stair-step grading to establish vegetative cover quickly. Rough grading is augmented temporarily by mulches until fast growing temporary canopies develop. Establishing and developing desirable vegetative covers depends on grading and soil preparation, soil amendments, mulches, and changing seed mixtures with seasons. Woodfiber applied at 750 lbs/A as a tacking agent for straw has provided a persistent mulch for winter seedings that is equal to or better than asphalt applied at 300 gal/A. The manipulation of these managements, through plant succession, leads to the development of a near maintenance free vegetation that needs little mowing and little or no fertilizer as with crownvetch, flat pea, and sericea. Harsh environments often have partial vegetative covers and multi-step seeding, and fertilization is required to develop protective vegetative canopies. Adequate soil amendments applied to a properly prepared seedbed eliminate the need for topsoil which is often of poor quality. Sparsely vegetated grass slopes may be eliminated by overseeding with legumes, phosphorus, lime, and mulches in favorable seeding seasons. (Sims-ISWS)
W79-01059

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
K. H. Yoo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 703, Price codes: A07 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute Research Technical C0mpletion - Report, June 1978. 115 p, 16 fig, 21 tab, 38 ref. OWRT A-047-IDA(1), 14-34-001-5012.

Descriptors: Runoff, Models, *Erosion, Overland flow, *Pacific northwest, Rill erosion, Watersheds(Basin), *Soil erosion, Idaho, Washington, Rainfall, Snowmelt, Soil moisture, *Palouse Prairie(Ida-Wash).

A soil erosion study was conducted to help understand soil loss from agriculture lands in the Palouse Praire of the pacific Northwest. A soil erosion model was coupled with the Idaho version of the USDAHL watershed model. The model was tested on 2 different size watersheds. The monthly and yearly simulations were good compared with the observed data except for the period of high stream flow simulated at the start of the water year. The eroded particles from each hydrologic zone cascade to a lower zne and finally to the channel. This cascading system shows the amount and location in terms of zones, where the erosion and deposition occur. Rill depth and distribution for any erosion period are the most important part of the model since rill erosion is calculated as a function of them. From field measurements, rill erosion is one of the most serious erosion sources in the Palouse. Channel scouring erosion is not as significant as upland erosion. High stream flow does not necessarily cause high soil loss and vice versa. Many of the problems, particularly with upland erosion, can be traced to inadequacies in the hydrologic model.
W79-01087

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN.
Purdue Univ., Lafayette, IN. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-01096

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2I.
W79-01099

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-01122

EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. J. Singer, and J. Blackard.
Soil Science Society of America Journal, Vol. 42, No. 3, p 481-486. May-June 1978. 2 fig, 3 tab, 22 ref. (California Water Resources Center Project UCAL-WRC-W-502).

Descriptors: *Erosion, *Soil erosion, *Mulching, Erosion control, Simulated rainfall, Sediments, Runoff.

Simulated rainfall was used to test the relationship between sediment in runoff and percentage of the soil that was mulch covered. Oak leaves (Quercus Douglasii H. & A.), redwood litter (Sequoia sempervirens (D. Don) Endl.) and oat straw (Avena barbata Brot.) were used as mulches on a 0.37m2 plot of Auburn (loamy, mixed, thermic, Ruptic-Lithic Xerochrepts) surface soil at a 9% slope. Cover percentage was related to sediment in surface runoff by a parabolic relationship. The relationship between redwood and oak covers and sediment in runoff was not significantly different, but both were significantly different from oat straw. Cover shape or distribution of inter-cover space appears to be important in affecting sediment

loss. Runoff volume was significantly reduced by high cover levels which protected the soil from sealing and helped maintain a high infiltration rate. (Snyder-Calif, Davis)
W79-01130

EVALUATION OF WILD OAT STRAW AS A SOIL EROSION RETARDANT USING SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. J. Singer, and J. Blackard.
Agronomy Journal, Vol. 69, p 811-814. Sept.-Oct. 1977, 3 fig, 2 tab, 15 ref. (California Water Resources Center Project UCAL-WRC-W-502).

Descriptors: Erosion, *Range management, Mulch, Runoff, *Soil erosion, Oat straw, Erosion control.

Soil cover is an important factor in soil erosion control. This study was made to determine the quantitative relationship between cover percent for one cover type and soil loss under simulated rainfall. Data from this experiment are used to calculate a cover coefficient for wild oat (Avena barbata Brot.) straw similar to the 'C' factor in the Wischmeier Universal Soil Loss Equation (USLE). The R,K,L,S, and P factors were kept constant during the experiment. A rainfall simulator was used in the laboratory to produce 30 min rainfall events of 76 mm/hour (3 in/hour) intensity on soil material at 9% slope. Under these conditions, wild oat straw significantly reduced sediment loss at cover levels of 50% or more. A significant reduction in runoff volume was observed for cover percentages exceeding 90%. A parabolic regression model $Y = 158.4 - 0.051X - 0.014X2$ which describes the relationship between Y sediment loss and X percent cover (0 to 100) was highly significant $R2 = 0.81$. The effect of the straw was to (1) reduce splash, (2) reduce soil crust formation, (3) block sediment movement, (4) delay runoff initiation, and (5) reduce total runoff loss. A cover coefficient (CC) can be calculated as a ratio of soil loss under any straw cover percent to soil loss under no straw cover. The relationship needs to be tested for other cover types before it is used with cover types different than straw mulch, or substituted for the C factor of the Wischmeier equation. (Snyder-Calif, Davis)
W79-01131

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5G.
W79-01160

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W79-01164

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 4A.
W79-01257

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst
J. R. Williams, and R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 942, Price codes: A08 in paper copy, A01 in microfiche. Technical Report No. 96, April 1978. 152 p, 7 fig, 16 tab, 50 ref. OWRT A-999-TEX(6).

Descriptors: *Watershed management, *Model studies, *Agricultural watersheds, *Optimization, *Computer models, Agricultural runoff, Sediment, Phosphorus, Nitrogen, Linear programming, Computer programs, Programming languages, Small watersheds, Crop production, Fertilizers, Decision making, Hydrograph analysis, Runoff, Routing, Water management(Applied), Land use, Optimum development plans.

A number of models were developed for use in managing large agricultural watersheds to obtain maximum agricultural production and maintain water quality standards. Special attention was given to models simulating daily runoff and sediment, phosphorus, and nitrogen which are considered the three most important agricultural pollutants. Frequency relationships were determined for these parameters for small watersheds up to 40 sq km in area. A model was developed for routing sediment, phosphorus, and nitrogen through streams and valleys of large watersheds with areas up to 2500 sq km and a problem-oriented computer language, SPNM, was developed for modeling sediment, phosphorus, and nitrogen yields. Another model, based on decision analysis and linear programming was developed to determine optimal operating policies for large watersheds. Strategies specifying the crop to be grown, fertilizer application rate, and type of conservation system were selected for each land class within each sub-watershed and the utility of each was determined by analyzing attributes important to decision makers. Linear programming is used to determine the optimal combination of strategies for the entire watershed. The overall combination of models was demonstrated with data from Little Elm Creek watershed and realistic resuls were obtained. (Majtenyi-IPA)
W79-01355

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
J. W. Delleur, and M. T. Lee.
Proceedings of the Indiana Academy of Sciences. Vol 83. p 196-203, 1974. 4 fig, 2 tab, 6 ref. OWRT B-008-IND(15).

Descriptors: *Geomorphology, *Indiana, *Streams, *Watershed basins, Watershed management, Drainage density, Drainage area, Stream ordering, Bifurcation ratio, Strahler.

Twenty-eight geomorphologic properties were obtained for each of 14 Indiana watersheds. These properties are based on Strahler's stream ordering system and on Shreve's stream link magnitude system. The laws of the stream numbers and of the stream lengths, in general, were found to be valid. The bifurcation ratio has a nearly constant value of about 4.5, almost equal to the ideal network value. The mean first-order stream length ranges from 0.08 to 0.13 miles, a comparatively low value due to the detail of the maps used. The drainage area is strongly correlated to the stream length and is inversely related to the watershed slope. Weaker correlations exist between the drainage area and the drainage density and between the drainage area and the texture ratio.
W79-01426

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W79-01498

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CAN SALAMANDERS AND FROGS SURVIVE THE THREAT OF ACID PRECIPITATION,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5C.
W79-01005

RECOVERY OF NITROSAMINES FROM WATER,
Cornell Univ., Ithaca, NY. Lab of Soil Microbiology.
For primary bibliographic entry see Field 5D.
W79-01006

PRECISION ANALYSIS FOR WATERBORNE CHRYSOTILE ASBESTOS BY TRANSMISSION ELECTRON MICROSCOPY,
Illinois Univ. at the Medical Center, Chicago.
W. H. Hallenbeck, E. H. Chen, K. Patel-Mandlik, and A. H. Wolff.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 5, p 551-558 1977. 5 tab, 30 ref. OWRT A-071-ILL(2).

Descriptors: *Asbestos, *Analytical techniques, *Pollutant identification, Water analysis, Chrysotile, *Electron microscopy, Analysis.

Detailed examinations of water samples were carried out to determine the precision ofanalysis for chrysotile asbestos by transmission electron microscopy (TEM). Since the frequency distribution of counts fits a Poisson distribution, several statistical inferences were made, including (1) an estimate of precision, and (2) a model for determining the probability of observing chrysotile as a function of its concentration in water and magnitude of area scanned by TEM.
W79-01010

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01014

BIOASSAYS ON MARINE ORGANISMS: ACUTE TOXICITY TEST OF MERCURY, CADMIUM, AND COPPER TO ARKSHELL, ANADARA BROUGHTONII, FROM JIN-DONG BAY, AND TO OYSTER, CRASSOSTREA GIGAS, FROM KWANGDO BAY, SOUTH COAST OF KOREA,
National Fisheries Research and Development Agency, Seoul (Republic of Korea).
For primary bibliographic entry see Field 5C.
W79-01015

A BIOLOGICAL INVESTIGATION OF AN ORGANICALLY POLLUTED URBAN STREAM IN VICTORIA,
Monash Univ., Clayton (Victoria). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-01016

POLLUTION STUDIES OF RIVER KHAN (INDORE) INDIA -- I. BIOLOGICAL ASSESSMENT OF POLLUTION,
Vikram Univ., Ujjain (India). School of Studies in Botany.
S. V. R. Rao, V. P. Singh, and L. P. Mall.
Water Research, Vol. 12, p 555-559, 1978. 3 fig, 3 tab, 22 ref.

Descriptors: *Water quality, *Bioindicators, *Trophic level, Monitoring, Water analysis, Water chemistry, Chemical analysis, Benthic fauna, Biological communities, Phytoplankton, Aquatic algae, Diatoms, Cyanophyta, Chlorophyta, Tubificids, *Saprobic system, *India, *River Khan(Indore).

Pollution studies of the River Kahn, Indore (India) have been made, with an emphasis on the biological assessment of water quality. This study covers a critical analysis and testing of various European methods for the biological monitoring of water pollution. The biological data have been correlated with the chemical data and the practical implications of the European saprobity system under Indian conditions have been discussed. The importance of benthic macro-invertebrates in the assessment of water quality in the river has also been discussed. (EIS-Deal)
W79-01018

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01022

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEWATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-01026

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01040

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
M. T. Downes.
Water Research, Vol. 12, No. 9, p 673-675, 1978. 4 fig, 6 ref.

Descriptors: *Nitrates, *Sampling, *Chemistry analysis, *Automation, Equipment, Instrumentation, Calibrations, Evaluation, Analytical techniques, Water pollution, Water pollution sources, Pollutants, Freshwater, Pollutant identification.

An automated nitrate determination was described in which nitrate is reduced to nitrite with hydrazine sulphate under alkaline conditions in the presence of Cu(2+) and Zn(2+). Interferences encountered in natural water samples were eliminated by the addition of Zn(2+) to the Cu(2+) catalyst solution. The method is suitable for the determination of low NO3-N concentrations and compares favorably with the manual copperized cadmium techniques for freshwater samples containing 10-800 mg/cu m NO3-N. The method is also linear at nitrate concentrations below 10 mg N/cu m. The standard deviations of blanks and of samples containing 2 mg NO3-N/cu m were 0.013 and 0.06 mg N/cu m, respectively, at an analysis rate of 30 samples/h. (Sims-ISWS)
W79-01042

QUANTITATIVE DETERMINATION OF QUATERNARY AMMONIUM BASES (QAB) IN WATER AND WASTEWATER BY THIN LAYER CHROMATOGRAPHY,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
E. R. Michelsen.
Tenside Detergents, Vol. 15, No. 4, p 169-175, July-August, 1978. 5 fig, 5 tab, 16 ref, 1 append.

Descriptors: *Surfactants, *Cation exchange, *Chromatography, *Density, *Anion exchange, Resins, Volumetric analysis, Separation techniques, Analytical techniques, Water analysis, Waste identification, Water pollution sources, Industrial wastes, Chemical wastes.

A procedure for quantifying cationic surfactants, especially quaternary ammonium bases, in the range of 0.002-1 mg/liter of water or waste water utilizes thin layer chromatography and densitometry. The samples are initially sublated with ethyl acetate-charged air or nitrogen and the residue is dissolved in methanol. The solution is passed through a double-layer ion exchange column bearing upper and lower layers of wide pore resin for anion and cation exchange; the sample separation procedures produces a runoff containing nonionic surfactants which may be measured separately. Quaternary ammonium bases are eluted from the cation exchange resin with methanolic hydrochloric acid, dried, and redissolved in chloroform. The sample is analyzed by chromatography on silica gel plates with a solvent mixture of ethyl acetate, glacial acetic acid, and water. The plates are aerated at room temperature and sprayed with a dilute reagent composed of bismuth(III) nitrate, glacial acetic acid, potassium iodide, and barium chloride. The plates are dried and covered with clean plates and the spots are measured at 525 nm by a densitometer with an integrating recorder. The recovery of cetylpyridiniumbromide (CPBr) in tap and waste water initially containing 0.1 and 2.5 mg CPBr/liter ranged over 98.4-113%. Anionic surfactant concentrations up to 10 mg/liter did not interfere with quantification of the cationic surfactant. (Lisk-FIRL)
W79-01070

DETERMINATION OF THE BICHROMATE OXIDIZABILITY OF SUGAR FACTORY EFFLUENTS (OPREDELENIE BIKHROMATNOY OKISLYAEMOSTI STOCHNYKH VOD SAKHARNOGO ZAVODA),
A. P. Parkhomets, A. I. Sorokin, and E. V. Ivashchenko.
Sakharnaya Promyshlennost, No. 3, p 22-25, March, 1978. 1 fig, 2 tab, 6 ref.

Descriptors: *Sugar crops, *Food processing industry, *Analytical techniques, *Chemical oxygen demand, *Volumetric analysis, Indicators, Chemical reactions, Boiling, Water quality, Pollutant identification, Waste water treatment, Industrial wastes.

A rapid method for the routine measurement of Cod in sugar refinery effluents is described. An 0.5-5.0 ml sample of waste water is first combined with 100 mg of mercury(II) sulfate and 20 ml of 0.4 N chromium sulfate solution. The mixture is boiled for exactly 5 min. The COD is then quantified by titrametric procedures using diphenylamine, 0-phenanthroline, or N-phenylan-thranylic acid as indicators. (Takacs-FIRL)
W79-01074

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01089

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
S. A. Wilson, and J. H. Weber.
Analytical Letters, Vol. 10, No. 1, p 75-84, 1977. 2 fig, 1 tab, 12 ref. OWRT A-035-NH(2), 14-31-0001-3829.

Descriptors: *Acidic soils, *Humates, Organic compounds, Water chemistry, Chemical properties, *Podzol soil, Humic acid, Fulvic acid, *New Hampshire, *Oyster River(NH), *Electron spin resonance.

The solid state and aqueous solution electron spin resonance (esr) spectra of Oyster River and Podzol soil fulvic and humic acids were analyzed. Because the aqueous solution esr spectra mimic the behavior of the model compound para-benzosemiquinone, it is concluded in spin concentration at a potential of 0.20 volts (vs. SCE) demonstrates that the semiquinone radicals are at least partially responsible for the reducing capability of humic materials. From the above results a quantitative semiquinone analysis for humic materials was devised.
W79-01133

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
For primary bibliographic entry see Field 5B.
W79-01207

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 2K.
W79-01212

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2K.
W79-01215

EFFECTS OF KELTHANE AND TEMPERATURE ON THE RESPIRATION OF CRANGON FRANCISCORUM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5C.
W79-01241

THE EFFECT OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
For primary bibliographic entry see Field 5G.
W79-01243

METALS FROM URBAN RUNOFF IN DATED SEDIMENTS OF A VERY SHALLOW ESTUARY,
California Univ., Irvine. School of Engineering.
E. R. Christensen, J. Scherfig, and M. Koide.
Environmental Science and Technology, Vol. 12, No. 10, p 1168-1173, October 1978. 4 fig, 4 tab, 16 ref.

Descriptors: *Sediments, *Heavy metals, *Estuarines, Trace elements, Chromium, Manganese, Iron, Cobalt, Copper, Zinc, Lead, Sampling, Chemical analysis, Sedimentation, Sedimentation rates, Bays, Coasts, Pollutants, Water pollution, Water pollution sources, Nonpoint water pollution sources.

Pollution sources for Newport Bay, California, are of a nonpoint nature. To assess the heavy metal pollution of sediments in Upper Newport Bay, receiving runoff from a watershed of 376 sq km, a number of sediment cores were dated and analyzed for Cr, Mn, Fe, Co, Cu, Zn, and Pb. The sedimentation rate was determined to be about 1.8 cm/yr by three independent methods: Pb-210 dating of selected cores, correlation between long-term oscillations in rainfall and similar variations vs. depth of grain size and heavy metal content in cores from

tidal flats, and estimation of the settleable solids budget. Vertical profiles of heavy metals in dated sediment cores indicated that Zn and Pb are the only metals of those investigated that show clearly increased levels in the uppermost strata, deposited since about 1955, when urban development in the watershed began. (Sims-ISWS)
W79-01251

ORGANIC COMPOUNDS IN THE DELAWARE RIVER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01252

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01254

ION EXCHANGE MEMBRANE METHODS FOR CONTINUOUS REMOVAL OF IONS FROM WATER AND TRACE CHEMICAL ANALYSIS,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 918, Price codes: A04 in paper copy, A01 in microfiche. University of Illinois of Urbana Champaign, Water Resources Center Research Report No 138, October 1978. 72 p, 13 fig, 10 tab, 2 ref. OWRT A-087-ILL(6).

Descriptors: *Chemical analysis, *Electrochemistry, Eletrodialysis, Ion exchange, Nitrogen compounds, Phosphates, *Pollutant identification, Chemical extraction, Electrodeposition, *Ion selective membranes, *Inorganic trace analysis, Metals-general.

Trace analysis of wastewater and natural water samples generally requires extensive sample pretreatment. Separation of the samples from concentrated receiver electrolytes by ion exchange membranes, which results in Donnan dialysis, provide rapid, precise, and accurate transfers of test ions from the samples into the electrolytes. Optimum receiver electrolytes were described for cations, anions of weak acids, and weakly basic aniona such as nitrate and chloride. The medthods were superior to solvent extraction, columnar ion exchange, and chemical digestions in comparative tests on surfce water and sewage samples. Donnan dialysis was also used as the basis for the design of voltammetric ion selective electrodes. A nitrate electrode was constructed which provideds a 3 order-of-magnitude linear range and a 6 micromolar detection limit. A system for continuous removal of selected ions which used Donnan dialysis followed by electrochemical deactivation was tested. Donnan dialysis was somewhat slower than electrodialysis under comparable conditions. A successful means of continuously reducing nitrate to ammonia was developed, but removal of phosphate based upon planting the ion as a sparingly soluble salt on an electrode failed because of surface passivation.
W79-01327

WATER CHEMISTRY AND THE RELIABILITY OF ELECTRONIC FIELD INSTRUMENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
R. W. Pennak
Limnol Oceanogr. 18(5), p 811-812, 1973.

Descriptors: Colorado, *Dissolved solids, Electronic equipment, Gravimetric instruments, New Mexico, Sewage effluents, Solids, *Water chemistry, Wyoming, Pollutant identification, Instrumentation.

A small portable meter was acquired which, the manufacturer claims, measures dissolved solids anywhere, is simple to operate, and gives instant readings without calculations. A wide variety of 1- to 3-1 water samples from lakes and streams in Wyoming, Colorado and New Mexico was used for comparing dissolved solids with readings obtained with the portable field instrument. With only 1 exception, all of the instrument readings were greater than their corresponding gravimetric determinations, some being very much greater. The instrument error ranged from -11.5%--+272.9%, the mean being +102.0%. Artificial seawater gave a reading 20% too high. Obviously this instrument is useless for freshwaters, sewage effluents, salt, or brackish waters. The fundamental difficulty lies with the manufacturer's misunderstanding of the gravimetric ratios of dominant ions in fresh and salt waters. Clarke gives the 'average' percentage composition of river and lake waters of North America as follows: CO3, 33.40; SO4, 15.31, Cl, 7.44; NO3, 1.15; Ca, 19.36; Mg, 4.87; Na, 7.46; K, 1.77; (Fe, Al)2O3, 0.64; SiO2, 8.60. A more reasonable freshwater instrument could probably be devised based on standardization with salt solutions representing these ionic approximations. Similarly, there is need for a separate model for marine and brackish water. Careful local standardization of any electronic device for aquatic work is necessary.--Copyright 1974, Biological Abstracts, Inc.
W79-01333

EVALUATION OF MICROMOLAR COMPLEXIMETRIC TITRATIONS FOR THE DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATERS,
North Carolina, State Univ. at Raleigh. Dept. of Chemistry.
K. W. Hanck, and J. W. Dillard.
Analytic Chimica Acta, Vol 89, p 329-338, 1977. 5 fig, 4 tab, 33 ref. OWRT A-052-NC(3). 14-31-0001-3533.

Descriptors: *Polaragraphic analysis, *Anodic stripping voltammetry, *Analytical techniques, *Trace metals, *Complexing capacity, EDTA, *Volumetric analysis, Metal ions, *North Carolina, *Pollutant identification, Trace elements, *Neuse River(NC).

The titration of micromolar levels of complexing agents with metal ion titrants, and voltammetric methods to locate the equivalence point, have been evaluated experimentally and theoretically. Both anodic stripping voltammetry and differential pulse polarography give systematically low results if labile metal ions are used as titrants. Low-temperature (0C) dual-cell anodic stripping voltammetry greatly minimizes the effects of metal complex lability but the mercury film electrodes deteriorate rapidly because of temperature cycling. A micromolar compleximetric titration with a voltammetric end-point is not a practical method for determining the complexing capacity of natural waters. (Kiger-N Carolina)
W79-01344

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER BY COBALT (III) COMPLEXATION,
North Carolina State Univ. at Raleigh. Dept. of Chemistry.
K. W. Hanck, and J. W. Dillard.
Analytical Chemistry, Vol. 49, p 404-409, March 1977. 4 fig, 7 tab, 25 ref. OWRT A-052-NC(4), 14-31-0001-3533.

Descriptors: *Polaragraphic analysis, Anodic stripping voltammetry, *Analytical techniques, *Trace metals, *Complexing capacity, EDTA, *Pollutant identification, Trace elements, *Neuse River(NC), *North Carolina.

The complexing capacity of natural water has been determined by complexation with Co3+. The method eliminates many of the problems of metal complex lability associated with previous procedures. A known excess of Co2+ was added to the sample. The Co(II) complexes formed were oxidized to kinetically inert Co(III) complexes with H2O2. After removing the excess H2O2 with the enzyme catalase, the unreacted Co2+ was determined by differential pulse polarography in 0.06 M ethylenediamine. The detection limit is 0.4 x 10 to the -6th power mol of ligand/I. Magnesium, calcium, sodium, potassium, chloride, sulfate, carbonate, and bicarbonate do not interfere. A semi-automated procedure was developed and applied to a series of natural water samples. (Kiger-N Carolina)
W79-01345

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF SPECIFIC VIRUSES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01352

A WATER POLLUTION SURVEY, MAINLY BY BRITISH SCHOOL CHILDREN,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5G.
W79-01354

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01358

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01362

GEOCHEMISTRY OF MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines, Golden.
A. J. Ramirez Rojas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 946, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis (1976). 112 p, 9 fig, 11 tab, 44 ref, 4 append. OWRT A-034-COLO(1), 14-34-0001-7012.

Descriptors: Mineralization, Water quality, *Mine drainage, *Colorado Mineral Belt, *Mine wastes, Chemical analysis, *Water analysis.

Results of the chemical analyses of water draining from 7 mine adits within five mining districts were compared to the ore petrology, ore mineralogy, and type of ore deposit. The water samples were collected in the Front Range Mineral Belt of Colorado in which most of the metal deposits are predominantly a complex mixture of copper, lead, zinc, and silver sulfides, gold tellurides and arsenides. The oxidation of pyrite which is asssocated with these complex ores yields acid water containing high concentrations of iron, sulfate and other trace metals contained in its structure. This acidity promotes the dissolution and oxidation of the other sulfides which release high concentrations of base metals to the water, but no additional acidity. The position and movement of the water table related to the ore veins and the type of ore play an important role in determining changes in the water quality from metal mine drainages. From these results, it was found that all the mine effluents fit the diffuse aquifer system. The Emmett and Clyde Mines are a good example of the type of ore vs. the water quality. In the Emmett Mine the acidity generated from the oxidation of pyrite promotes the solubility of fluoride which releases hydrofluoric acid which attacks the silicate rocks. All these reactions are responsible for the chemistry of the water found in this adit. The Clyde Mine, which shows almost complete absence of sulfide minerals, has the best water quality of all the mine effluents studied. Calculated values for redox potentials using the ferric-ferrous couple and taking into account the ionic strength activity coefficients

and ferric sulfate and fluoride complexes agree very well with the measured Eh values. Conductivity was also found to correlate really well with the total dissolved solids. These results demonstrate the utility of Eh and conductance measurements in acid mine drainages.
W79-01363

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01369

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-01374

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01375

PROGRAM FOR MONITORING SURFACE-WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01376

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

WATER-QUALITY INDICES FOR SPECIFIC WATER USES,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-01381

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01382

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01387

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

LAG ADJUSTMENT BETWEEN ESTIMATED AND ACTUAL PHYSIOLOGICAL RESPONSES CONDUCTED IN FLOW-THROUGH SYSTEMS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W79-01445

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-01448

INFLUENCE OF SEDIMENT IN COPPER TOXICITY TESTS WITH THE POLYCHAETE NEANTHES ARENACEODENTATA,
Environmental Research Lab., Narragansett, RI.
C. E. Pesch, and D. Morgan.
Water Research, Vol. 12, p 747-751, 1978. 2 fig, 4 tab, 12 ref.

Descriptors: *Copper, *Toxicity, *Bioassay, Mortality, *Sediments, Sands, Sea water, Worms, Aquatic animals, Water chemistry, Chemical analysis, Metals, Path of pollutants, *Polychaetes, Neanthes, *Tissue analysis, *Bioaccumulation.

Adult male Neanthes arenaceodentata were exposed to measured concentrations of 0.04, 0.06, 0.10, 0.16, and 0.26 mg 1-l Cu in a continuous-flow bioassay system, with and without a clean sand, to assess the influence of sand on Cu induced mortality. The presence of sand did affect the results. The 28-day LC50 was lower for polychaetes exposed without sand than those with sand. The reasons for this difference are discussed. (EIS-Deal)
W79-01460

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
For primary bibliographic entry see Field 5C.
W79-01469

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
For primary bibliographic entry see Field 5C.
W79-01471

CHLORO-ORGANICS IN SURFACE WATER SOURCES FOR POTABLE WATER,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-01472

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
Y. Lee, and C. Brosett.
Swedish Water and Air Pollution Research Institute, B 442, June 1978. 30 p, 7 fig, 6 tab, 11 ref.

Descriptors: *Gran's plot, *Volumetric analysis, *Acids, *Precipitation(Atmospheric), *Fallout, *Lakes, *Analytical techniques, Rainfall, Hydrogen ion concentration, Equations, Baltic Sea, Gulf of Bothnia, Kattegat, Sweden, Weak acids, Methodology, Particulates.

An expression derived for the slope of Gran's plot (an acid-base titration procedure) is shown to be useful in determining whether a titrated sample contains weak acids other than those known to exist in the system. The slope of Gran's plot had been observed to vary from case to case due to the presence of weak acids, and the equation was derived to express the relationship between the slope and components contributing to the acid-base equilibrium. The new method was applied to: (1) rainwater samples, (2) leaching solutions of airborne particles, and (3) lake water. In the rainwater and airborne particle samples, it was found that no unknown weak acids were present that could affect pH in the 4-5 range, but use of the method with seven lake water systems clearly indicated the presence of weak acids. Through trial and error it was shown that there was one predominate weak acid with an apparent dissociation constant of about .0003. Its concentration could be calculated, and it was found to be linearly correlated to the color of the samples. In cases with more than one weak acid, analysis may be possible using a generalized least-squares method. Precipitation and particle samples were collected on the Swedish Baltic Sea coast in the Gulf of Bothnia, and lake samples were collected at an inland location near the Kattegat Channel between Sweden and Denmark. (Lynch-Wisconsin)
W79-01474

USE OF UNICELLULAR ALGAE FOR EVALUATION OF POTENTIAL AQUATIC CONTAMINANTS,
California Univ., Irvine.
J. Scherfig, P. Dixon, C. Justice, and R. Appleman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 565, Price codes: A03 in paper copy, A01 in microfiche. Report No. AMRL-TR-76-65, 1976. 24 p, 3 fig, 6 tab, 10 ref. F33615-76-C-55.

Descriptors: *Pollutants, *Selenastrum capricornutum, *Bioassay, *Bioindicators, *Toxicity, *Analytical techniques, Water pollution effects, Jet fuels, Hydrazines, Lubrication additives, Cultures, Continuous culture, Batch culture, Methodology, Algae, Monomethylhydrazine, Stimulation, Environmental effects, Lethal limit, OPAN.

The unicellular alga Selenastrum capricornutum was used in bioassay experiments to determine toxic or stimulatory effects of jet fuels, lubrication additives, and hydrazines on algal growth. Tests were conducted under standard laboratory conditions using standard batch and continuous cultures of S. capricornutum in the presence of bacteria. The Standard Batch Algal Assay appert to be a relatively easy, sensitive, and inexpensive method for evaluating chemicals that enter the aquatic environment. Current research has emphasized de-

velopment of bioassay protocol, photosynthetic methods of assessment, and chemical and algalassessment of hydrazine. Methods and procedures are discussed in detail, including determination of Selenastrum growth rate under batch conditions, hydraZine determination, reagents and apparatus, continuous culture, photosynthesis/respiration (Warburg experiments, dissolved oxygen probe), and Coulter counter procedure. Aeration did not statistically affect the rate of hydrazine decomposition, but the rate increased with increasing concentration of medium. A stratistically significant (> 90%) difference in maximum algal cell volume for 10% SAAM at hydrazine levels of 10, 5, and 0.5 microliter/liter was observed. Effects of OPAN have not been determined. Exposure of algal cells to SDMH at 10 mg/liter resulted in a morphological variant 30-43% smaller than normal cells, but it is uncertain that this was due to the SDMH. (Lynch-Wisconsin)
W79-01476

5B. Sources Of Pollution

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 566, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. 600/2-76-043, February, 1976. 332 p.

Descriptors: *Simulation analysis, Runoff, Hydrology, Soil erosion, Nitrogen, Phosphorus, Snowmelt, Watersheds, Pesticides, Return flow, *Nutrients, *Model studies.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM) Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrients transformations on small agricultural watersheds. The report discusses the major modifications to and differences between the PTR and ARM Models. An energy-balance method of snow simulation, and a first-order transformation approach to nutrient modeling are included. Due to lack of data, the nutrient model was not tested with observed data; testing and refinement are expected to begin in the near furture. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (Skogerboe-Colorado State)
W79-01004

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
V. A. Matulewich, and M. S. Finstein.
Applied and Environmental Microbiology, Vol 35, No. 1, p 67-71, January 1978. 4 tab, 14 ref. OWRT A-030-NY(5), 14-31-0001-3830.

Descriptors: Stream pollution, *Path of pollutants, *Nitrificaton, *Sediment-water interfaces, Nitrites, Nitrates, Nitrogen benthos, *New Jersey, *Passaic River(NJ), Distribution, *Nitrifying bacteria.

The abundance of nitrifying bacteria, determined by most-probable-number procedures, within habitats of the Passaic River was as follows: rooted aquatic plants > algae approximately or equal to rocks > sediments >> water. On the average, NH4+ oxidizers were 540-fold more abundant in the topmodt 1 cm of sediment than in the water, and NO2 oxidizers were 250-fold more abundant. The population densities in this surface sediment at two nearby stations, one with a predominantly mineral stream bed and the other an organic ooze, did not differ significantly. Large numbers of nitrifiers were present to a depth of about 5 cm in a mineral sediment core. These results show the importance of rooted aquatics and of sedimentary deposits in the nitrification process of polluted streams.
W79-01007

MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines Golden.
T. R. Wildeman.
Colorado Mining Association 1976 Mining Yearbook, p 54-68. 5 fig, 3 tab, 6 ref. OWRT A-034-COLO(4), 14-34-0001-6006.

Descriptors: *Mine effluents, Water quality, *Mine drainage, *Colorado Mineral Belt, Colorado, Rocky Mountain region, *Colorado Front Range.

Recent studies on the chemistry of water associated with mining activities in Colorado and particularly in the Front Range Mineral Belt, are summarized. Most water of poor quality flows from abandoned mines, and drainage from active operations is not necessarily harmful. Water of poorest quality will be generated where pyrite is a predominant vein mineral. Most mine drainages are recharged by a diffuse flow aquifer system in which the water residence time is on the order of months and the water chemistry shows little response to changes in precipitation and the seasons. Water from a disseminated ore system will generally be of poorer quality than that from a vein ore system. If much of the ore body occurs above the water table, oxidation of the vein minerals is promoted which leads to water of poor quality. Two maintenance rules should yield mine effluents of better quality in active mining operations: (1) keep the contact time of the water with the vein minerals as short as possible, and (2) seal the vein minerals from the air wherever possible.
W79-01008

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
K. W. Yearn, and Y. A. Park.
The Journal of the Oceanographical Society of Korea, Vol. 13, No. 1, p 19-28, 1978. 12 fig, 2 tab, 20 ref.

Descriptors: *Iron, *Zinc, *Manganese, Chemical analysis, Metals, Path of pollutants, Bottom sediments, Leaching, Salinity, Suspended solids, Suspended load, Sediment load, Sediment transport, Particle size, Estuaries, Silts, Clays, *Korea, *Kum River(Kor), *Mankyung River(Kor).

To estimate the chemical mass balance of several kinds of trace metals in sea water, suspended matter and bottom sediments, sixty samples from the Kum and Mankyung estuaries (Korea) were analyzed. In both estuaries, the distribution patterns of leachable suspended trace metals and of bottom sediments were established to be similar. The relationship between the metal concentration and clay content of the sediments was found to be such that the metal concentration increased with an increase in clay content. A linear correlation was determined between the pairs of leachable metals (Fe-Zn, Fe-Mn and Zn-Mn) in the Kum estuary. However, in the Mankyung estuary linear relationship does not exist. Finally, it is suggested that the trace metals are reworking in the Kum estuary and those in the Mankyung estuary are sinking. (EIS-Katz)
W79-01014

POLLUTION STUDIES OF RIVER KHAN (INDORE) INDIA -- I. BIOLOGICAL ASSESSMENT OF POLLUTION,
Vikram Univ., Ujjain (India). School of Studies in Botany.
For primary bibliographic entry see Field 5A.
W79-01018

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
D. G. Shaw, L. M. Check, and A. J. Paul.
Estuarine and Coastal Marine Science, Vol. 5, p 429-436, 1977. 1 tab, 2 fig, 18 ref.

Descriptors: *Adsorption, *Intertidal areas, *Oil spills, *Pollutant identification, *Biodegradation, On-site investigations, Tidal effects, Gas chromatography, Sediments, Water pollution effects, Path of pollutants, Organic compounds, *Alaska, *Port Valdez(Alas).

The uptake and release of Prudhoe Bay crude oil by intertidal sediments at Port Valdez, Alaska, have been studied. In two experiments designed to simulate the stranding of a light oil slick, oil was spread on sediments daily for 5 days. Hydrocarbon content of the top 1.0cm of the sediments was monitored for 60 days from the first oiling. The two experimental rates of oil application were 1.2 microliters per square cm and 5.0 microliters per square cm. In both experiments the added oil was no longer detectable on the sixtieth day. Possible reasons for this rapid loss of petroleum by sediments are discussed. (EIS-Katz)
W79-01022

CHLORINATED HYDROCARBONS IN MARINE INSECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
L. Cheng, and T. F. Bidleman.
Estuarine and Coastal Marine Science, Vol 5, p 289-291, 1977. 1 tab, 9 ref.

Descriptors: *Aquatic insects, *Pesticide residues, *DDT, *Path of pollutants, *Food webs, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Pesticides, Insects, Invertebrates, On-site investigations, *Halobates, Fucellia, Rheumatobates, *Bioaccumulation, *Marine insects.

Total DDT concentations in the oceanic Halobates were found to be 5-10 times higher (180-400 ng/g dry wt.) than those of the related nearshore Rheumatobates (less than 50 ng/g) or of the comon beach fly Fucellia (18 ng/g). This difference could perhaps be explained by the different diets of these three marine insects: Halobates being a predator of zooplankton, while Rheumatobates feeds on phytophagous insects and fucellia feeds on more or less decomposing seaweeds. The PCB concentrations (110-300 ng/g) were about the same in the two-sea-skaters, but slightly lower in the beach fly (62 ng/g). (EIS - Katz)
W79-01023

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01028

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
B. C. Scott.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1375-1389, September 1978. 4 fig, 1 tab, 39 ref, 4 append. Dep. Energy EY-76-C-06-1830.

Descriptors: *Sulfates, *Precipitation(Atmospheric), *Fallout, Rainfall, Snowfall, Sulfur compounds, Sulfur, Water chemistry, Chemistry of precipitation, Clouds, Cloud physics, Water pollution, Water pollution sources, Weather, Meteorology, Sulfate removal, Washout.

The concentration of sulfate in precipitation was predicted to be directly proportional to the sulfate concentration of the air ingested into the cloud, and inversely proportional to cloud water concentration. In addition, for light to moderate precipitation rates, the removal of airborne sulfate by precipitation was forecast to be strongly dependent upon the mechanism of precipitation formation. If the precipitation is in the form of snow or originated as snow in the upper portions of the clouds, then the surface sulfate concentration of precipitation is proportional to R to the (-0.3) power, where R is the precipitation rate. Should the precipitation form without the benefit of an initial ice growth stage, then the sulfate concentrations in precipitation water can increase by a factor of 2 to 10 or more over the ice-dependent predictions. Limited surface observations gave support to these predictions. The analyses leading to the prediction of washout ratios also were used to forecast the mean oxidation rate of SO2. In order to replace the SO4 removed from the atmosphere by each precipitation event, SO2 is required to oxidize at an average rate (over several days) of 0.2-2.0% per hour. (Sims-ISWS)
W79-01038

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
D. Gardner.
Water Research, Vol. 12, No. 8, p 573-575, 1978. 1 fig, 16 ref.

Descriptors: *Mercury, *Rivers, *Sampling, Surveys, Chemical analysis, Chemicals, Freshwater, Lakes, Geology, Trace elements, Heavy metals, Water quality, *England, *Lake Windermere, Dissolved mercury concentrations.

Typical dissolved mercury (Hg) concentrations in unpolluted waters are alleged to be less than 50 ng/l and sometimes less than 10 ng/l. Mean concentrations found in the catchment area of Lake Windermere were found to range between 12 and 29 ng/l over a three month period. However, in particular instances, concentrations of 75 and 96 ng/l were found, and were thought to be due to runoff from mineral deposits and sewage outfalls respectively. (Sims-ISWS)
W79-01040

GULL DROPPINGS AND THEIR EFFECTS ON WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
D. J. Gould, and M. R. Fletcher.
Water Research, Vol. 12, No. 9, p 665-672, 1978. 2 fig, 7 tab, 31 ref.

Descriptors: *Gulls, *Birds, *Animal wastes(Wildlife), *Water quality, *Bacteria, Laboratory tests, Coliforms, Streptococcus, Clostridium, Salmonella, Nutrients, Nitrogen, Phosphorus, Water pollution, Water pollution sources, Water birds, Analytical techniques, Bioindicators, Biology, Gull droppings.

Droppings collected over periods of 24 h, from four species of captive gulls of the genus Larus, were examined for total coliforms, fecal coliforms, fecal streptococci and Clostridium perfringens. Samples also were monitored for salmonella, and representative groups of samples were analyzed for nutrient content. The occurrence of several types of droppings, characterized by their color and consistency, was recorded. Daily loads of coliform bacteria indicated that the outputs of the two larger species of gull approximated to values quoted for man; values for other indicator bacteria, however, were considerably lower in all gull species. Salmonella were not detected. Daily loads of Kjeldahl nitrogen from each bird varied from 608 to 1,819 mg, and total phosphorus from 3 to more than 115 mg, according to species. (Sims-ISWS)
W79-01041

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
L. V. Sick, C. C. Johnson, and R. Engel.
Journal of Geophysical Research, Vol. 83, No. C9, p 4659-4667, September 20, 1978. 5 fig, 3 tab, 35 ref.

Descriptors: *Trace elements, *Metals, *Estuaries, *Marine biology, On-site investigations, Tidal waters, Zooplankton, Dissolved solids, Suspended solids, Chlorophyll, Density, Temperature, Water temperature, Salinity, Secchi disks, Turbidity, Sampling, *Delaware Bay, Fronts(Oceanic), Tidal fronts.

A frontal system of lower Delaware Bay was investigated to illustrate the role that such tidal fronts can have in concentrating trace metals and serving as a means for introducing trace metals into the trophic hierarchy of estuaries. This frontal system typically develops on ebb tide and can extend at least 32 km parallel to the central axis of Delaware Bay. In relation to samples collected on either side of the front, chlorophyll a concentrations and concentrations of selected trace metals in zooplankton, particulates, and the dissolved fraction were significantly higher in samples collected at the front. Seasonally, concentrations of cadmium and copper in all fractions were highest during the summer or fall. Differences in taxonomic composition of zooplankton assemblages, as well as differences in total numbers of organisms across the front, suggest advective transport by convergent water masses. (Sims-ISWS)
W79-01046

LABORATORY INVESTIGATION OF WATER POLLUTION BY ORGANIC SUBSTANCES IN FLAX WASTES DELIGNIFICATION (LABORATORNE SLEDOVANIE ORGANICKEHO ZNECISTENIA VOD PRI DELIGNIFIKACII LANOVYCH ODPADOV),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Papir a Celuloza, Vol. 33, No. 5, p 33-38, 1978. 10 fig, 7 tab, 5 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Lignins, *Bleaching wastes, *Alkalis(Bases), Organic wates, Chemical oxygen demand, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

The organic composition of spect liquors from delignification of raw flax wastes was evaluated in a kraft pulping operation for the production of cigarette papers. Three grades of laboratory processed flax raw material with lignin concentrations of 8.9-15.7% were employed; the raw flax wastes contained 91.42-92.71% solids and 2.00-3.62% ash. The solids, ash, annealing residue, BOD, and COD content of the spect liquors and bleaching effluents were measured. The lignin concentration and other parameters of the raw material were also reported. The lignin concentration and other parameters of the raw material were also reported. The quantity of alkali added during the pulping process and the grade of flax raw material directly influenced the organic quality of the spent liquors. When the alkali addition was held constant, the length of the pulping time did not affect the organic content of the liquors. (Lisk-FIRL)
W79-01085

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources.
K. A. Healy, H. E. Klei, and D. W. Sundstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 641, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, 1978. 15 p, 5 fig. 2 tab. OWRT A-067-CONN(2), 14-31-0001-6007.

Descriptors: *Incineration, *Leachate, *Groundwater, Waste disposal, Hydraulic properties, Mechanical properties, Municipal waste, Landfills, *Incinerator residue, *Municipal sewage sludge incinerator ash, Leaching characteristics, Sanitary landfills, Lysimeter studies, pH variation, Batch studies.

This project has determined the hydraulic and mechanical characteristics of incinerator residue from solid wastes and from sewage sludge. Large samples of incinerator residue were obtained from several incinerator plants in Connecticut and brought to the soil mechanics laboratory at the University of Connecticut for testing. The hydraulic permeability and strength of compacted incinerator residue were measured. Qualitative and quantitative leaching characteristics of unquenched municipal sewage sludge incinerator ash were studied with respect to amount of water applied and pH variation. Chemical digestion by wet decomposition of unquenched ash showed high residual concentrations of magnesium, sodium, calcium and potassium. Iron was contained in the highest residual concentration of all heavy metals monitored, with zinc second and chromium, coabalt, copper, manganese, nickel and lead present in lower concentrations. Batch ad lysimeter studies were used to examine the eluting of the above cations out of the ash and into the water. In addition sulfur, nitrate and chloride were monitored with sulfate having the highest concentrations. Lysimeter effluent analysis revealed basically similar types of 'inmmediate washing out' curves for both cations and anions with the exception of calcium, which remained in relatively higher concentrations for a longer period of time before its concentration declined. (Scottrans-Conn)
W79-01090

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

OXIDATION-REDUCTION CHEMISTRY AND AQUEOUS AMMONIUM OXIDATION IN THE ESTIMATION OF NITRATE BY THE CADMIUM REDUCTION METHOD,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
B. Sharma, R. C. Ahlert, and J. Saldick.
J. Environ. Sci. Health - ENVIRON. SCI. ENG., A11(3), p 255-279, 1976. OWRT A-037-NJ(1), 14-31-0001-5030.

Descriptors: *Cadmium, *Ammonia, *Nitrates, Nitrates, *Ammonium oxidation, Cadmium reduction, Nitrate ion.

Experimental and thermodynamic evidence is presented to show that nitrate-N can be reduced beyond nitrite-N in a cadmium reductor. The studies are made in a batch system and include the effect of sample to reductor ratio. Data presented show that aqueous ammonium-N can be oxidized in nitrite-N at a rate of about 0.1 - 0.04 percent per day in the presence of air and cadmium-copper or cadmium-mercury complex. The rate of this oxidation, unaffected by absence of light, is reduced to the order of 0.001 percent per day or less in a nitrogen atmosphere and cadmium-mercury complex. Hence a requirement for air is suggested for the oxidation reaction.
W79-01100

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 30, No. 11, p 30-31, November, 1978.

Descriptors: *Hazards, *Water pollution, *Waste disposal, Solid wastes, Sludge disposal, Accidents,

Waste disposal wells, Injection wells, Regulations, Groundwater.

Indiscriminate disposal of hazardous chemical wastes often leads to ground-water contamination. Land spreading as a method of sludge disposal warrants caution since sludge may contain organic and inorganic chemicals and viruses which may harm ground water. Accidental spills of toxic materials are becoming more common due to lack of controls on the transportation of hazardous materials. There is a need for more effective clear-up methods. Improved design and detailed hydrogeologic evaluations have made modern injection wells more safe. However, the threat of ground water pollution is still present due to the high solubility of toxic chemicals and the slow rate of ground water flow. Hazardous materials can be properly stored, transported and disposed if state and federal governments develop adequate regulations. In addition, there should be mandatory comprehensive monitoring of storage and disposal facilities and more frequent and detailed analysis of water sources susceptible to contamination. (Purdin-NWWA)
W79-01113

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W79-01127

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 15, No. 1, January-February 1977. 6 p, 9 fig, 6 ref. (California Water Resources Center Project UCAL-WRC-W-517). OWRT A-060-CAL(1).

Descriptors: *Groundwater, *Irrigation practices, Saline deposits, Water quality, Path of pollutants, Agricultural runoff, Stream-aquifer systems.

One of the more subtle and dangerous areas of pollution is that occurring in ground water from normal irrigation practices. The pollution from salt buildup is presently one of the unsolved problems in managing stream-aquifer systems. Several strategies that offer a possibility of controlling this salt buildup are described. For example, instead of applying irrigation ground water near the site of the well, the ASTRAN Method transfers it downstream to be applied on land where the ground water is a lower quality thereby controlling the increase in salt concentration. Instead of preventing seepage loss in delivery canals, the percolating water is used to maintain ground-water quality. Finally, timed releases of return flow remove salts without exceeding surface-water quality constraints. (Snyder-Calif, Davis)
W79-01132

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
In: Urban Runoff Quality - Measurement and Analysis, Urban Water Resources Research Council, ASCE Preprint 3091, San Francisco, CA, Oct. 17-21-1977, p 35-59, 7 fig, 1 tab. OWRT A-046-NJ(1), 14-34-0001-8032.

Descriptors: *Biochemical oxygen demand, *Organic matter, *Water quality, *Water resources, *Planning, *Heavy metals, Water pollution, *Urban runoff.

Areawide water quality planning under Section 208 of P.L. 92-500 (The Pollution Control Amendments of 1972) is intended to provide an integration of approach between the effluent treatment standards prescribed by other sections of the act, and the requirement that in obtaining prescribed water quality criteria consideration be given to nonpoint sources of pollution as well as point sources. The lack of a prior data base and of adequate technology for analyzing pollution from these diverse sources has created some difficult problems in carrying out this planning. The report gives characteristics of urban runoff including BOD, phosphates, heavy metals and hydrocarbons, and explains problems of data gathering and analysis. Much of the work done so far in 208 planning can be regarded only as tentative, and additional funds and new procedures will be required for its completion. Among measures to be considered are combined-purpose detention storage to be applied to future new developments, a monitoring and surveillance program to detect illegal waste disposal practices, and measures for proper disposal of waste crankcase oil. Measures for control of general erosion should be encouraged. Control of eutrophication processes, protection of aquifers and proper direction of land use planning are usually essential parts of such plans.
W79-01134

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W79-01135

DRIFT VELOCITY OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
J. D. Lin, M. C. Mohr, and G. S. Campbell.
In: Proceedings 17th Congress of the International Association for Hydraulic Research, p 173-179. 1977, 4 fig, 13 ref. OWRT A-059-CONN(3), 14-31-0001-5007.

Descriptors: *Oil spills, *Flow measurement, *Oil-water interfaces, *Waves(Water), *Wind velocity, Water pollution sources, Water pollution control, *Surface films, *Drift velocity, *Oil slick spreading, *Wind-generated waves, *Mechanically generated waves, Laboratory wind-wave channel, Polyethelene sheets, Wave steepness.

Drift velocity of surface films floating on the water surface under the action of wind-generated waves and mechanically generated waves respectively has been investigated in a laboratory wind-wave channel by using polyethelene sheets. In order to simulate the drift of oil slicks in a laboratory channel, the size of the film should be greater than two wavelengths for wind-waves and one wavelength for mechanically generated waves. Drift velocity over wind-generated waves is a function of wind velocity and wave steepness. However, the ratio of drift velocity to shear velocity of the air boundary layer correlates uniquely with wave steepness and becomes independent of wave steepness for sufficiently large wave steepness. For mechanically generated waves, film drift velocity is substantially greater than the surface particle drift of the Stokes waves. In comparison of the drift velocities in a wave field characterized by wave steepness, the effect of wind on drift velocity of surface films predominates in general over that due to waves.
W79-01139

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 5C.
W79-01199

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 604, Price codes: A03 in paper copy, A01 in microfiche. Report No. SA/TIB-25, March 1972. 40 p, 3 fig, 6 tab, 4 append.

Descriptors: *Water pollution, *Industrial wastes, *Radioactive wastes, *Uranium, *Mine wastes, Sampling, Reservoirs, Radium, Colorado, Sediments, Water quality, Pollution(Stream), Monitoring, On-site investigations, Water quality control, Chemical analysis, Radioactivity, Environmental control.

Water quality of Ralston Creek in the vicinity of the Schwartzwalder uranium mine north of Golden, Colorado, was monitored as a supplement to State/Water Board programs. Emphasis was placed on eliminating data voids, such as radioactivity concentrations in the waters of Ralston Reservoir and Upper Long Lake. Sample collection also included mine effluents, water and bottom sediments from Ralston Creek and Long Lake ditch, and bottom sediment from these sources. A monitoring program was recommended to insure complete and thorough surveillance of these water supply sources. The basic objective was defined as eliminating release of radioactivity-bearing solids (ore fines) to Ralston Creek and maintaining dissolved concentrations of radium-226 and uranium in the creek as far as practicable below 1.0 pCi/L and 1.0 mg/L, respectively. To maintain a suitable environment for development of a diverse aquatic population, levels below 500 micro g/L may be necessary. (Majtenyi-IPA)
W79-01207

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 321, Price codes: A13 in paper copy, A01 in microfiche. EPA Report No. 330/2-73-004, April 1973. 257 p, 14 fig, 42 tab, 8 ref, 7 append.

Descriptors: *Water pollution, *Water pollution sources, *Industrial wastes, *Monitoring, Municipal wastes, Effluents, Biochemical oxygen demand(BOD), Total organic carbon, Kjeldahl nitrogen, Water quality standards, Pollutants, Tennessee, Holston River, Evaluations, Water pollution control, Heated water, Heavy metals, Pulp wastes, Toxicity.

A stream survey was conducted on the South Fork of the Holston River and on the Holston River in and near Kingsport, Tennessee to determine the effects of municipal and industrial waste disposal on river water quality. This was a followup investigation to studies done in 1969 and 1972 and involved measurements of biochemical oxygen demand, total organic carbon, total kjeldahl nitrogen, and nitrite + nitrate nitrogen. Pollution studies focused on discharges from the Kingsport municipal wastewater treatment plant and seven industrial firms: Tennessee Eastman Company, Holston Army Ammunition Plant, Mead Papers, Holliston Mills, ASG Industries, Inc., Penn-Dixie Cement Corporation, and J. P. Stevens. The wasteloads of various pollutants are reported for each of the point sources and recommendations are given for improving water quality to meet State and local effluent standards. Appendices provide details of the sampling procedures and sample stations, methods of analysis, and bioassay methods, as well as tabulations and detailed discussion of the waste sources. (Majtenyi-IPA)
W79-01208

EVALUATION OF THE IMPACT OF THE MINES DEVELOPMENT, INCORPORATED MILL ON WATER QUALITY CONDITIONS IN THE CHEYENNE RIVER.
Environmental Protection Agency, Denver, CO. Region VIII

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 270, Price codes: A04 in paper copy, A01 in microfiche. September 1971. 51 p, 2 fig, 10 tab.

Descriptors: *Water pollution, *Radioactive wastes, *Industrial wastes, *Seepage, *Mine wastes, Mine drainage, Water pollution sources, Cheyenne River, Edgemont, South Dakota, Uranium, Radium, Molybdenum, Water quality, Flow rates, Chemical analysis, Reservoirs, Standing waters, Sampling, On-site investigations, Radiochemical analysis.

The water quality of the Cheyenne River and its tributary, Cottonwood Creek, located near the Mines Development Mill in Edgemont, South Dakota, was studied to determine the general water conditions during dry weather and also the chemical and radioactive pollutants contributed by seepage from mill ponds. During the study period, flows in Cottonwood Creek averaged 0.1 cfs upstream to 0.5 cfs at the mouth and flows in the Cheyenne River ran from 5 cfs upstream to about 132 cfs further downstream with most of this contributed by another tributary. Analysis revealed that seepage from mill ponds raised uranium concentration in Cottonwood Creek to ten times the natural level; however, there was negligible concentration increase in the Cheyenne River because of the greater dilution capacity. Studies on the radium concentration were not fully consistent with the findings for uranium but difficulties with the analytical technique may account for this discrepancy. Visual inspection of pooled areas in the creek revealed a yellowish green color similar to that of water samples obtained from seepage areas. Detection of high concentrations of molybdenum, which is a mill byproduct, further corroborate the source of the seepage contamination. It was concluded that seepage from ponds is continuing despite the fact that the pond is an inactive repository for uranium and sand tailings. A check on the water in the Angostura Reservoir showed that uranium concentrations were at natural background levels with no difference between surface and bottom samples. (Majtenyi-IPA)
W79-01209

THE ECOTONE BETWEEN SPARTINA FOLIOSOA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01218

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
S. L. Ponce, and R. H. Hawkins.
Water Resources Bulletin, Vol. 14, No. 5, p 1187-1200, October 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Utah, *Salinity, *Overland flow, *Colorado River Basin, *Shales, Irrigation, On-site investigations, Specific conductivity, Rainfall, Runoff, Water pollution sources, Model studies, *Price River Basin(Utah), *Mancos shale, *Nonpoint source loading function, Microwatershed.

This study emphasized a field investigation of salt release to overland flow from Mancos shale lands of the Price River Basin, Utah. Although a high degree of natural variation existed in the data, precluded the separation of factors affecting diffuse salt loading that occurs during overland flow, a simplistic nonpoint source loading function developed on empirical concepts was fit to the data. This function then was used to calculate the average annual salt yield on the Price River by overland flow. It was found that even under severe conditions, the salt yields from Mancos shale lands due to overland flow are relatively minor, accounting for less than 1.5% of the average annual salt mass transported from the basin by the Price River. (Visocky-ISWS)
W79-01245

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
R. P. Eganhouse, D. R. Young, and J. N. Johnson.
Environmental Science and Technology, Vol. 12, No. 10. p 1151-1157, October 1978. 6 fig, 4 tab, 28 ref.

Descriptors: *Mercury, *Sediments, *Outfall sewers, *California, *Pacific Ocean, Sampling, On-site investigations, Chemicals, Chemical analysis, Sewage, Heavy metals, Leaching, Pollutants, Path of pollutants, Water pollution, Coasts, Oceans, *Palo Verdes(Calif).

Sediments affected by a major submarine wastewater outfall on the Palos Verdes shelf analyzed for total mercury and organic mercury. In addition, chemical leaching studies were performed to determine the phase partitioning of mercury in these sediments. A statistically significant decline in surface sediment concentrations of total mercury during ,1972-1975 may be due to several factors, including the reduced emission of wastewater solids. Organic mercury levels up to 21.3 micro g/dry kg and 2% of the total mercury were found in sediments near the outfalls; however, the sulfide-rich sediments in the immediate vicinity of the outfalls contained low or undetectable levels of organic mercury. Most of the mercury in these sediments is fixed in a refractory phase, although organic-associated mercury increases in prominence away from the outfalls. In the most-contaminated sediments, mercury appears to be accumulating in this refractory phase and, hence, is largely unavailable for introduction into the tissues of local marine life. (Sims-ISWS)
W79-01250

ORGANIC COMPOUNDS IN THE DELAWARE RIVER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
L. S. Sheldon, and R. A. Hites.
Environmental Science and Technology, Vol. 12, No. 10, p 1188-1194, October 1978. 6 fig, 1 tab, 27 ref. NSF ENV75-13069.

Descriptors: *Water pollution, *Organic compounds, *Rivers, *Pennsylvania, *New Jersey, *Delaware River, Water pollution sources, Pollutants, Path of pollutants, Chemicals, Chemical analysis, Chemical wastes, Water chemistry, Chlorophyll, Algae, Industrial wastes, Sediments, Waste water(Pollution), Potable water, Water treatment.

Nearly 100 compounds were identified in Delaware River water samples taken in August 1976 and March 1977 between Marcus Hook, Pennsylvania, and Trenton, New Jersey. Extractions with Ch2Cl2, liquid chromatographic cleanup and gas chromatographic mass spectrometry were used for compound separation and identification. The observed compounds included natural products, municipal wastes, and industrial contaminantes. The latter were of 3 types: those found in industrialized urban areas with no particular production source, such as aromatic hydrocarbons and phenols; those commonly used in manufacturing processes, such as plasticizers and industrial solvents; and those specific to a single source and traceable to that source, such as a series of chlorinated aliphatic and aromatic polyethylene glycols which were specific to a plant in the Philadelphia area. (Sims-ISWS)
W79-01252

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
S. Kobayashi, and G. F. Lee.
Environmental Science and Technology, Vol. 12, No. 10, p 1195-1200, October 1978. 3 fig, 6 tab, 22 ref.

Descriptors: *Lake sediments, *Arsenic compounds, *Sodium arsenite, *Lakes, *Sediments, *Wisconsin, Sampling, Coves, On-site data collections, Laboratory tests, Chemical analysis, Calcium, Manganese, Iron, Phosphorus, Carbon, Chemicals, Surveys, Pollutants, Water pollution.

Sodium arsenite, an aquatic herbicide, has been used extensively in Wisconsin lakes for the control of excessive macrophyte growths. Sediments in several of these treated lakes were investigated for patterns of arsenic accumulation with depth and for relationships to iron, manganese, calcium, and organic carbon content. All sediments had substantial accumulations of arsenic, but no predominant correlation was found with other measured components. In these surficial sediments, arsenic appears to be in a nonoccluded form, with highly organic sediments being more readily leached of arsenic than highly calcareous sediments. (Sims-ISWS)
W79-01253

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw, and B. A. Baker.
Environmental Science and Technology, Vol. 12, No. 10 p 1200-1205, October 1978. 1 fig, 5 tab, 19 ref.

Descriptors: *Organic compounds, Harbors, *Alaska, Sampling, On-site investigations, Bays, Oil, Biota, Water, Sediments, Chemicals, Chemical analysis, Oil spills, Pollutants, Path of pollutants, Water pollution, Water pollution sources, *Port Valdez(Alaska).

Saturated and unsaturated hydrocarbons were determined quantitatively in biota, water, and sediments of Port Valdez, Alaska. The analyses showed the kinds and amounts of hydrocarbons typical of unpolluted nearshore marine environments. Common, prominent compounds include pristane, heptadecane, odd chain length normal alkanes with 21-31 carbon atoms, and a triterpene tentatively identified as squalene. Environmental samples for this work were collected during the period of approximately one year prior to the completion of the trans-Alaska oil pipeline. The operation of a tanker loading facility associated with that pipeline at Valdez will result in a controlled input of petroleum into Port Valdez. The results presented here provide a basis from which to investigate the fate of that added oil. (Sims-ISWS)
W79-01254

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
K. Goto, T. Tanemura, and S. Kawamura.
Water Research, Vol. 12, No. 9, p 735-740, 1978. 3 fig, 9 tab, 7 ref.

Descriptors: *Acid mine water, *Mine drainage, *Hydrogen ion concentration, *Water pollution, Water pollution sources, Mine wastes, Mine acids, Sulphur, Mining, On-site investigations, Surveys, Lakes, Streams, Alkalinity, Powerplants, Model studies, Mathematical models, Foreign countries, Foreign research, *Japan, *Lake Toya(Japan), Sulphur mines, Mine flooding.

The effect of acid mine drainage on the change of lake water pH was discussed in terms of acid-base balance between the incoming acid and the alkalinity present in the lake water. Comparisons were made between the pH values observed in the past and those calculated from a few assumptions made

about the initial alkalinity of the lake water and the rate of acid supply to the lake. The results explained the reason why the pH of Lake Toya did not drop appreciably until recently, in spite of continued introduction of acid mine drainage. The more recent sharp drop in lake water pH was attributed to the exhaustion of the alkalinity by continued discharge of acid water to the lake. The effectiveness of mine flooding in reducing acid discharge from abandoned sulphur mines also was discussed. (Sims-ISWS)
W79-01258

THE IMPORTANCE OF WATER FOR THE SPREAD OF POTENTIALLY PATHOGENIC MYCOBACTERIA: II. GROWTH OF MYCOBACTERIA IN WATER MODELS, (IN GERMAN),
Forschungsinstitut, Borstel (West Germany). Inst. fuer Experimentelle Biologie und Medizin.
For primary bibliographic entry see Field 5C.
W79-01259

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01283

BIODEPOSITION BY SALT-MARSH INVERTEBRATES,
Georgia Univ., Sapelo Island. Marine Inst.
J. N. Kraeuter.
Marine Biology, Vol. 35, No. 3, p 215-223, April 16, 1976. 2 fig, 5 tab, 43 ref.

Descriptors: *Invertebrates, *Organic wastes, *Salt marshes, *Biogeochemical cycles, Deposition, Organic matter, Sediments, Productivity, Marshes, Estuaries, Biodeposition.

The importance of salt-march invertebrate biodeposits in biogeochemical cycles are discussed. Yearly biodeposition rates of nitrogen, phosphorus, potassium, magnesium, maganese, copper, zinc, and molybdenum are reported for 5 invertebrate species. The 5 species (Littorina irrorata, Arcatula demissa, Polymesoda caroliniana, Uca magnax and U. pugilator) deposit 1709 g dry weight m (2) year (-1), of which 455 g m(2) year (-1) is organic material. Calculations suggest that the invertebrates are capable of processing 53% of the marsh's yearly production, but the actual aount utilized is probably substantially less than this. (Maroncelli-Mass)
W79-01288

NITRATE AND NITRITE IN THE SURFACE WATERS OF TWO DELAWARE SALT MARSHES,
Delaware Univ., Newark. Dept. of Biological Sciences.
D. Aurand, and F. C. Daiber.
Chesapeake Science, Vol 14, No 2, p 105-111, June, 1973. 4 fig, 16 ref.

Descriptors: *Nitrate, *Nitrite, *Surface waters, *Delaware, *Salt marshes, Marshes, Control structures, Tidal exchange, Ditches, Inorganic compounds, Tides, Tidal waters, Tidal effects, Salinity, *Path of pollutants, Distribution.

The distribution of nitrate and nitrite in two Delaware salt marshes was studied from July 1966 through December 1967. Canary Creek Marsh, located near the mouth of Delaware Bay, was characterized by high salinity, low nitrate water. The Murderkill Marsh, in central Delaware, was characterized by low salinity, high nitrate water. Man-made control structures in the Murderkill Marsh inhibited free tidal exchange and modified the distribution of nitrate and nitrite. Maximum nitrate concentrations occurred in the winter, while minimum concentrations were observed during the summer. Summer nitrate concentrations in the Canary Creek Marsh ranged from undetectable (less than 2 micrograms-at/l) to 8 micrograms-at/l. Winter values were generally between 10 and 25 micrograms-at/l. At the Murderkill Marsh, winter nitrate concentrations ranged from 40-100 micrograms-at/l, and the summer concentrations were generally in the range of 5 to 20 micrograms-at/l. Nitrite concentrations in both areas rarely exceeded 1.5 micrograms-at/l, and exhibited no discernable seasonable pattern. The study suggests that ditching and control structures in marshland areas can have an inhibitory effect on the nutrient exchange with the estuarine community. (Maroncelli-Mass)
W79-01291

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01299

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
For primary bibliographic entry see Field 2H.
W79-01300

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
For primary bibliographic entry see Field 2G.
W79-01303

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01336

DISSOLVED ORGANIC CARBON FLUXES IN THE SHETUCKET RIVER OF EASTERN CONNECTICUT, USA,
Conneticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01337

MIXING AND DISPERSION IN ESTUARIES,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer.
Annual Review of Fluid Mechanics, Vol. 8, p 107-133. 1976. 6 fig, 91 ref, (California Water Resources Center Project UCAL-WRC-W-486).

Descriptors: *Estuaries *Mixing, *Saline water-freshwater interfaces, *Stratification, *Dispersion, *Path of pollutants.

Described are analytic techniques to try to understand the process of mixing in estuaries and to quantify such aspects as residence times and pollutant concentrations. In hydrodynamic terms all schemes distinguish three major categories of estuaries: sharply stratified estuaries, such as fjords and salt-wedge estuaries; partially stratified estuaries, in which there is a significant vertical-density gradient and vertical mixing is inhibited; and well-mixed estuaries. In this review only the latter two categories, are considered. An updated account is presented of knowledge of the causes of dispersion in estuaries. Emphasis is on the period 1967-1974. Current methods for predicting and modeling dispersion and how these are limited by the still incomplete understanding of the dispersion process are described. (Snyder-Calif Davis)
W79-01338

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
W. W. Sage.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 982, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, May 1978. 47 p, 1 fig, 15 tab, 19 ref. OWRT A-099-MISS(2), 14-34-0001-7052.

Descriptors: *Cyanophyta, *Salt marshes, *Sampling, *Biological communities, Ecological distributions, Salinity, Population, Distribution patterns, Schizothrix calcicola, Light intensity, Aquatic life, Ecotypes, Dominant organisms, Algae.

Samples of edaphic bluegreen algal communities were collected from five monotypic angiosperm zones in Graveline Bay Marsh near Ocean Springs, Mississippi, and later evaluated in the laboratory to determine the species distribution and relative abundances. Results showed that communities in all five zones of the marsh were dominated by Schizothrix calcicola (Ag.) Gom. throughout the year and subdominants varied seasonally. In all zones, the number of individuals was greatest in the summer and lowest in winter. Examining structure of the five edaphic communities indicated a single, nearly homogeneous community exists over the entire marsh surface which is shaded by an angiosperm canopy. Light intensity appears to be the major factor affecting distribution of bluegreen algae in this salt marsh, as has been found in other North Atlantic temperate salt marshes. Similarity indices were calculated for community pairs and species diversity was determined for each edaphic habitat. Relative abundance of 25 species is tabulated as well as descriptive habitat parameters, such as salinity, temperature, height of angiosperm canopy, and light energy in the blue band reaching the marsh surface. (Majtenyi-IPA)
W79-01356

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: I. NITRATE,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 3F.
W79-01360

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
J. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 242, Price codes: A06 in paper copy, A01 in microfiche. M.A. thesis, September 1972 110 p. 12 fig, 21 tab, 43 ref. OWRT B-077-MO(1), 14-31-0001-3608.

Descriptors: Groundwater, Iron, Sulfides, Nitrogen, Phosphorus, Landfill leachate, Sewage lagoon, Geochemistry, *Missouri, *Kohl Spring(MO), Hydrogen sulfide, Iron sulfide, Water pollution sources, Water disposal.

The ground water in three localities which had changed from iron- and sulfide- free water to unpotable water contaning abundant hydrogen sulfide and colloidal iron sulfide was studied in detail. Each of these areas had sanitary land fill or industrial waste disposal operations and sewage lagoons or municipal sewage treatment plants within one mile of the polluted area. The distinction between groundwater pollution resulting from an influx of sanitary landfill leachate as opposed to contributions from sewage tratment facilities has been difficult because there are no individual dissolved species that are diagnostic of either type of contaminant. However, landfill leachates have ratios of total inorganic nitrogen to total phosphorous in the range 500-1500 which is very different from the ratios reported for raw waste-water (1.0) or sewage treatment plant effluent (2.0). In the absence of other obvious sources of nitrogen or phosphorous, the ratio of total inorganic nitrogen to total phosphorous shows considerable promise as a means of discrimination contamination from wastewater tratment facilities. The Data from the field studies indicate that the water polluton in each case was a result of improperly operated landfill or industrial waste disposal operations. (Carpenter-Missouri)
W79-01421

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

METHODS OF CONTAMINATION OF TWO FRESHWATER FOOD CHAINS BY COBALT 60: I. DIRECT CONTAMINATION OF THE ORGANISMS BY THE WATER (MODALITES DE LA CONTAMINATION DE DEUX CHAINES TROPHIQUES DULCAQUICOLES PAR LE COBALT 60: I. CONTAMINATION DIRECTE DES ORGANISMES PAR L'EAU),
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance (France). Lab. D'Etude de la Pollution des Eaux.
For primary bibliographic entry see Field 5C.
W79-01442

APPLYING A CHEMICAL MODELLING TECHNIQUE TO ECOLOGICAL PROBLEMS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
G. A. M. King.
Ecological Modelling, Vol. 5, p 259-268, 1978. 2 fig, 6 ref, append.

Descriptors: *Model studies, *Computer models, Ecology, Mathematical models, Computer programs, Analytical techniques, Programming languages, Data collections, Data processing, Growth rates, Productivity, Trophic level, *Methodology, *Ecological modelling.

A very simple computer program can be adapted to handle both complicated chemical and ecological problems, by using procedures which reduce different reaction types and flows of material to one form. The process of reduction discloses similarities between ecological situations which, at first sight, seem very important. (EIS-Deal)
W79-01444

EXPERIMENTAL STUDY ON THE CONCENTRATION PROCESS OF TRACE ELEMENT THROUGH A FOOD CHAIN FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Okayama Univ. (Japan). Inst. for Agricultural and Biological Sciences.
I. Aoyama, Y. Inoue, and Y. Inoue.
Water Research, Vol. 12, p 831-836, 1978. 7 fig, 1 tab, 6 ref.

Descriptors: *Food chains, *Cesium, Heavy metals, Growth rates, Nutrient requirements, Ecology, Path of pollutants, Predation, Radioactivity techniques, Tracers, Fish physiology, Fish food organisms, Fish behavior, Mathematical models, Absorption, *Tissue analysis, Oryzias, Astronotus, *Bioaccumulation.

This paper describes the importance of a food chain in estimating the concentration of heavy metals from the viewpoint of nutrition ecology. The experiments were performed to investigate the effects of the following experimental conditions on the uptake of heavy metals by a predator, using 137Cs as a tracer; ration size per day, feeding interval and the change in weight of the predator fish. The set of results showed that (1) the concentration of a metal in predator fish increased with the ration size, (2) the feeding interval had no effect on the uptake of the metal by fish under the experimental conditions, and (3) the concentration in the growing fish was decreased with the increase of its weight. The paper also deals with the compartment model applied to the concentration process of the metal by a fish. The theoretical results depicted well the experimental ones. (EIS-Deal)
W79-01461

THE AVAILABILITY OF SEDIMENT-BOUND COBALT, SILVER, AND ZINC TO A DEPOSIT-FEEDING CLAM,
Geological Survey, Menlo Park, CA.
S. N. Luoma, and E. A. Jenne.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750929-4, Price codes: A03 in paper copy, A01 in microfiche. Proceedings of Biological Implications of Metals in the Environment, 15th Life Sciences Symposium, Hanford, Washington, 31 p, 1975. 5 fig, 5 tab, 17 ref.

Descriptors: *Clams, *Uptake, *Silver, *Cobalt, *Zinc, *Sinks, Metals, Sediments, Bottom sediments, Physicochemical properties, Tracers, Radioactivity techniques, Benthic fauna, Carbonates, Animal physiology, Food chain, *Bioaccumulation, *Bioavailability, *Tissue analysis, *Macoma, Metal sediment association.

The availability to Macoma balthica of sediment-bound metals was dependent upon the physical-chemical nature of the metal-sediment association. Laboratory studies of bioaccumulation from individual sedimentary trace-element sinks labelled with radioactive tracers of Ag, Co and Zn indicated bioavailability varied among metals within a given sink and among sinks for a given metal. Little bioaccumulation was observed from several sinks which may be common in nature, e.g., little Zn or Co uptake was observed when those metals were coprecipitated with amorphic iron oxide or manganese oxide. However, Ag, Co, and Zn were all taken up from detrital organics and Ag was accumulated by the clam from the iron oxide precipitate. Even quantitatively minor sinks within aquatic sediments may be important sources of some metals for M. balthica. (EIS-Deal)
W79-01468

CHLORO-ORGANICS IN SURFACE WATER SOURCES FOR POTABLE WATER,
Oak Ridge National Lab., TN.
R. L. Jolley, and W. W. Pitt, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-77055-2, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the 1977 Disinfection Symposium, American Water Works Association, Held at Anaheim, California on May 8-13, 1977. 13 p, 2 tab, 53 ref.

Descriptors: *Potable water, *Surface waters, *Organochlorine compounds, *Chlorinated hydrocarbon pesticides, *Reviews, *Water pollution sources, Water supply, Organic compounds, Pesticide residues, Bioaccumulation, Pesticides, Point pollution, Nonpoint pollution, Agricultural runoff, Urban runoff, Sewage disposal, Land disposal, Fallout, Cooling waters, DDE, Atrazine, Dieldrin, Landfills.

Literature on the presence and formation of chlor-organics in natural waters is surveyed, with attention to: (1) point and nonpoint sources in surface waters, and (2) transport, distribution, degradation, and toxicity. Chloro-organics enter surface water from a variety of point sources, such as sewage treatment plant effluents, industrial process effluents, and chlorinated cooling waters from electric power-generating plants. Nonpoint sources include dust and particulate fallout, leachate from landfills and land disposal sites, agricultural runoff, and urban runoff. Studies indicate that agricultural runoff is the major source of surface water contamination. Current water treatment processes may not effectively or completely remove chlorinated pesticides and related materials; pesticide concentrations in finished potable waters of major cities drawing their supply from surface waters have ranged from 0.0004-0.002 ppb for dieldrin, 0.00-0.005 ppb for DDE, and 0.03-0.4 ppb for atrazine. Relatively little is known about transport, distribution, chemical and biological degradation, and toxicity of the majority of chloro-organics in surface waters. Concentrations of chloro-organics are generally in the ppb range or less, but bioaccumulation may enhance the ecological effects of organchlorine compounds. (Lynch-Wisconsin)
W79-01472

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
D. B. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 054, Price codes: A04 in paper copy, A01 in microfiche. IIHR Report 200, March 1977. 51 p, 27 tab, 4 ref. DACW25-76-C-0056.

Descriptors: *Coralville Reservoir(IA), *Water quality control, *Water pollution sources, *Iowa River, *Reservoirs, Flood control, Impoundments, Rivers, Streamflow, Iowa, Nonpoint pollution, Agricultural runoff, Data collections, Water chemistry, Hydrology, Lake morphometry, Dams.

Annual data gathered 1975-76 for the Coralville Reservoir Water Quality Project (Iowa City, Iowa), initiated in 1964, are consistent with results of prior studies. Limnology and water quality were influenced primarily by: (1)nonpoint agricultural pollution, (2) hydrological characteristics of the Iowa River, (3) morphometry of the reservoir, and (4) fluctuations in the reservoir's storage and pool level resulting from flood control operations. The study's purpose is to determine effects of a flood-control reservoir on chemistry and biology of the parent river. Samples were collected from the Iowa River upstream and downstream from the dam, and from various depths in the reservoir. Measured were termperature, conductivity, turbidity, DO, pH, plankton, carbon dioxide, alkalinity, phosphate, ammonia, nitrate, total and suspended solids, threshold odor, BOD5, total and fecal coliforms, and fecal streptocci. During most of the water year river inflow to the impoundment was substantially below normal, and mean monthly flows for August (278 cfs) and September (133 cfs) were the lowest 1956-76. The average for those months was 1438 and 603 cfs 1967-76. Orthophosphate, ammonia nitrogen, and total coliforms tend to be low during low-flow years such as 1976, and high during medium (1971) or high-flow years (1973). Low inflow and stable pool level were probably partly responsible for large plankton populations in the reservoir june-September. (Lynch-Wisconsin)
W79-01473

5C. Effects Of Pollution

CAN SALAMANDERS AND FROGS SURVIVE THE THREAT OF ACID PRECIPITATION,
Cornell Univ., Ithaca, NY.
F. H. Pough.
In: NAHO, a publication of the New York Museum, The State Education Department, Albany, NY., 12206, Vol. 11, No. 1, p 6-9, Spring 1978. OWRT A-077-NY(1), 14-34-0001-7068, 8034.

Descriptors: *Frogs, *Salmanders, *Breeding, *Acid precipitation, Amphibians, Ponds, New York, Ecosystems, Experiments, *Air pollution effects, Weather patterns.

As soon as Spring rains begin to melt the Winter snows in central New York, amphibians migrate to and enter into their breeding ponds and begin their generation process. Studies conducted at Cornell University have shown that as a result of the weather patterns prevailing over North America, central New York and southern New England receive the greatest impact of acid precipitation. Breeding habits of frogs and salamanders are described and various studies on the effects of acid precipitation on the propagation of these two types of amphibian are discussed.
W79-01005

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-01007

TOXICITY AND MUTAGENICITY OF 2,4,6-TRINITROTOLUENE AND ITS MICROBIAL METABOLITES,
California Univ., Berkeley, School of Public Health.
W. D. Won, L. H. DiSalvo, and J. Ng.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 497, Price codes: A02 in paper copy, A01 in microfiche.
Applied and Environmental Microbiology, Vol. 31, No. 4, p 576-580, 1976. 2 fig, 4 tab, 9 ref.

Descriptors: *Explosives, *Toxicity, Oysters, Copepods, Chlorophyta, Larval growth stage, Salmonella, Cytological studies, Bacteria, Microbial degradation, Biodegradation, Metabolism, Chemical properties, Bioassay, Growth rates, Organic compounds.

TNT of explosive grade is highly toxic to marine forms that included freshwater unicellular green algae (Selenastrum capricornutum), tidepool copepods (Tigriopus californicus), and oyster larvae (Crassostrea gigas), and mutagenic to Salmonella typhimurium. On the basis of mutagenic assays carried out with a set of histidine-requiring strains of bacterium, TNT was detected as a frameshift mutagen that significantly accelerates the reversion rate of a frameshift tester, TA-98. In constrast, the major microbial metabolites of TNT appeared to be non-toxic and nommutagenic. (EIS-Katz)
W79-01012

EFFECT OF DDT AND POLYCHLORINATED BIPHENYLS ON CELL POPULATION GROWTH OF CRITHIDIA FASICULATA, A FLAGELLATED PROTOZOAN,
Armed Forces Radiobiology Research Inst., Bethesda, MD.
J. E. French, and J. F. Roberts.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 867, Price codes: A02 in paper copy, A01 in microfiche.
Armed Forces Radiobiology Research Institute, Report AFRRI SR76-21, 21 p, May 1976. 6 fig, 2 tab, 19 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Toxicity, *Growth rates, *Protozoa, Cytological studies, Pesticide toxicity, Metabolism, Chlorination, Bioassay, Chemical properties, Chlorinated hydrocarbon pesticides, Aroclors, Radioactivity techniques, Tracers, Carbon radioisotopes, Organic compounds, Path of pollutants, Biochemistry, *Crithidia.

Cell population growth inhibition of Crithidia fasciculata by cell density and cell protein assays after p,p'-DDT and polychlorinated biphenyl (PCB) exposure during exponential growth was analyzed. DDT was apparently not metabolized by this cell. In vitro tests indicated that PCB toxicity increased with decreasing percent chlorination of the mixture. Cell density correlated with cell protein as a measure of toxicity of PCB but not for p,p'-DDT. A critical concentration range was observed above which the effects were decreased relative to those from lower concentrations employed. The maximum concentration of DDT associated with the cellular compartment occurred by 6 hours of exposure. The sensitivity of C. fasciculata to DDT or PCBs makes it an appropriate model for further xenobiotic-cell interaction studies involving these compounds. An inexpensive and rapid screening method for toxic chemical compounds used by military organizations is of great importance. To meet these requirements, an inexpensive and quick screening method was developed using the protozoan C. fasciculata. (EIS-Katz)
W79-01013

BIOASSAYS ON MARINE ORGANISMS: ACUTE TOXICITY TEST OF MERCURY, CADMIUM, AND COPPER TO ARKSHELL, ANADARA BROUGHTONII, FROM JIN-DONG BAY, AND TO OYSTER, CRASSOSTREA GIGAS, FROM KWANGDO BAY, SOUTH COAST OF KOREA,
National Fisheries Research and Development Agency, Seoul (Republic of Korea).
J. S. Park, and H. G. Kim.
The Journal of the Oceanographical Society of Korea, Vol. 13, No. 1, p 35-43, 1978. 3 fig, 6 tab, 19 ref.

Descriptors: *Cadmium, *Mercury, *Copper, *Oysters, *Toxicity, Metals, Heavy metals, Mortality, *Bioassay, Animal behavior, Lethal limit, Water pollution effects, Commercial shellfish, *Mollusks, *Arkshell, Anadara.

Acute toxicity of mercury, cadmium, and copper to arkshell and to oyster was determined by static bioassays. During the observations of the opening rate of the shell mercury was the most sensitive toxicant causing the test animals to close their shellvalves together after being exposed to a mercury solution for an hour. Opening rate to cadmium and copper increased gradually at the higher concentration. The death rate of oysters for cadmium was lower than that of the mercury and copper test solutions. For oysters, mercury was the most toxic substance, and cadmium was the least toxic one. The medium lethal time (LT50) value decreased gradually at higher concentration of heavy metals. LC50 and LT50 data on the three substances was presented for both species. (EIS-Katz)
W79-01015

A BIOLOGICAL INVESTIGATION OF AN ORGANICALLY POLLUTED URBAN STREAM IN VICTORIA,
Monash Univ., Clayton (Victoria). Dept. of Zoology.
I. C. Campbell.
Australian Journal of Marine and Freshwater Research, Vol. 29, p 275-291, 1978. 6 fig, 3 tab, 59 ref.

Descriptors: Streams, *Biological communities, *Aquatic populations, *Domestic wastes, *Benthic fauna, Water pollution effects, Bioindicators, Invertebrates, Water quality, Aquatic microorganisms, Tubificids, Diptera, Monitoring, Water quality control, *Australia, *Dandenong Creek(Australia).

The macrofauna of Dandenong Creek, an organically polluted urban stream in Victoria, was studied. It was difficult to separate effects due to pollution from those due to other forms of interference. No true indicator species was found, but seven groups of common animals could be arranged in order of increasing pollution tolerance: Atalophlebiodes, Trichoptera, Chironomidae, Potamopyrgus, Bulinus, Tubificidae, and Psychodidae. Some of the difficulties of using biological systems for stream monitoring are discussed. (EIS-Katz)
W79-01016

IMPACT OF MINE DRAINAGE ON A MOUNTAIN STREAM IN PENNSYLVANIA,
Illinois Inst. of Tech., Chicago. Pritzker Dept. of Environmental Engineering.
R. D. Letterman, and W. J. Mitsch.
Environmental Pollution, Vol. 17, p 53-73, 1978. 9 fig, 4 tab, 33 ref.

Descriptors: *Mine drainage, *Benthic fauna, *Coal mine wastes, *Fish populations, *Iron compounds, Biomass, Sampling, Benthos, Acid mine water, Water quality, Mine wastes, Water pollution sources, Water pollution effects, Invertebrates, Biological communities, On-site investigations, Water temperature, Sculpins, *Pennsylvania, *Ben's Creek(Penn).

Physicochemical parameters and fish and benthic macroinvertebrates community structure were studied in a small mountain stream in western Pennsylvania. Sampling stations were located upstream and downstream of coal mine drainage in an otherwise unpolluted stream. Due to an alkaline discharge and significant upstream alkalinity the pH below the mine discharges remained between 6.5 and 8. The major factor affecting the benthic community and fish population appeared to be ferric hydroxide deposition. Rates of deposition during dry-weather conditions ranged from 3 grams per square meter per day near the discharges to 0.01 grams per square meter per day at the downstream end of the study site. The biomass of macroinvertebrates decreased from approximately 14 g wet wt per square meter above the discharges to 0.1-1.5 g wet wt per square meter within the area of iron disposition. Invertebrate diversity decreased significantly at the discharge but recovered to 75% of upstream values. The low but constant-temperature discharge from the mine may have enhanced the diversity recovery. The standing crop of fish decreased from approximately 228 to 11 kg/ha. Benthic fishes such as sculpin and suckers were the groups most affected. (EIS-Katz)
W79-01017

EFFECT OF MERCURIC CHLORIDE ON THE DIGESTIVE SYSTEM OF A TELEOST FISH, CHANNA PUNCTATUS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
K. V. Sastry, and P. K. Gupta.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 353-360, 1978. 2 tab, 17 ref.

Descriptors: *Mercury, *Digestion, *Toxicity, *Enzymes, Animal metabolism, Fish physiology, Heavy metals, Bioassay, Biochemistry, Amino acids, Proteins, Water pollution effects, Path of pollutants, Mode of action, *Teleost fish, *Tissue analysis, *Channa punctatus.

The effect of 1.8 mg/liter (LC50) of mercuric chloride exposure on the activities of alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, amylase, pepsin, trypsin, tripeptidase glycyl-glycine dipeptidase, and carnosinase has been examined in Channa puncatatus. The three phosphatases have been inhibited in the liver but showed an increase in activity in the intestine and pyloric caeca. Amylase, pepsin, and trypsin have also shown a slight increase in activity. There has been no significant alteration in the activities of the peptidases. The results have shown that mercury inhibits the activities of phosphatases in the liver but has no significant effect on the digestive enzymes within the experimental period of 96 hours. (EIS-Deal)
W79-01019

SHELL STRUCTURE OF IMMATURE ROMAN SNAILS (HELIX POMATIA) AFTER EXPOSURE TO P,P'-DDT,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
A. S. Cooke.
Environmental Pollution, Vol. 17, p 31-37, 1978. 1 tab, 3 fig, 9 ref.

Descriptors: *DDT, *Animal physiology, *Snails, *Environmental effects, Calcium carbonate, Invertebrates, Calcium, Mollusks, Gastropods, Electron microscopy, Water pollution effects, Chlorinated hydrocarbon pesticides, Pesticide residues, *Helix pomatia, *Shell thickness(Snails), *Sublethal effects.

Shells were examined from immature snails (Helix pomatia) that had been treated with DDT or deprived of access to calcium carbonate. Exposure to DDT resulted in shell thinning with the thickness of each of the three structural layers being inversely related to the body burden of DDT. The normal crossed lamellar structure was distorted in some of the thin shells. Withholding calcium carbonate led to similar changes, and DDT may cause thin shells by impairing calcium metabolism. (EIS-Katz)
W79-01020

ABUNDANCE, DIVERSITY, AND STABILITY IN SHORE-ZONE FISH COMMUNITIES IN AN AREA OF LONG ISLAND SOUND AFFECTED BY THE THERMAL DISCHARGE OF A NUCLEAR POWER STATION,
Battelle Columbus Lab., Duxbury, MA.
R. E. Hillman, N. W. Davis, and J. Wennemer.
Estuarine and Coastal Marine Science, Vol. 5, p 355-381, 1977. 13 tab, 6 fig, 25 ref.

Descriptors: *Biological communities, *Seasonal, *Environmental effects, *Marine fish, *Silversides, Fish populations, Fish, Populations, On-site investigations, Sampling, Nuclear powerplants, Ecological distribution, *Thermal pollution, Killifishes, Estuarine environment, *Connecticut, *Species diversity, *Millstone Point(Conn), Menida.

Shore-zone fish communities in the area of a nuclear power station at Millstone Point, Connecticut, on Long Island Sound, were studied from May 1969 through December 1975. Over 81,500 fish, representing at least 35 species, were collected. Species diversity, species richness, and species evenness indexes were calculated for 4 affected and 2 control sites for each year. In addition, the degree of community similarity at each site was assessed year to year. The most abundant species at each site was the Atlantic silverside, Menida menida. In general, species diversity, richness, and evenness fluctuated at each site seasonally and from year to year such that no trends could be determined. There was a distinct shift in community similarity through 1974 and 1975 at most sites. Since no evidence could be found that operation of the power station was responsible for the changes, it was concluded that such fluctuations were natural, and would be observed in any ecosystem if it were studied for several consecutive years. It is suggested that the concept of community or ecosystem stability be re-examined and possibly redefined in light of these distinct fluctuations over 6 years. (EIS-Katz)
W79-01021

CHLORINATED HYDROCARBONS IN MARINE INSECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W79-01023

THE FEASIBILITY OF SUSPENSION CULTURE OF OYSTERS (CRASSOSTREA VIRGINICA) AT A PETROLEUM PLATFORM OFF THE TEXAS COAST,
Moody Coll. of Marine Sciences and Maritime Resources Galveston, TX.
J. Ogle, S. M. Ray, and W. J. Wardle.
Contributions in Marine Science, Vol. 21, p 63-76, 1978. 5 fig, 4 tab, 18 ref.

Descriptors: *Aquiculture, *Oysters, *Commercial shellfish, *Growth rates, *Offshore platforms, Shellfish, Invertabrates, Mollusks, Estuarine environment, Habitats, Chlorophyll, Environmental effects, Oil industry, Phytoplankton, Mortality, Methodology, Animal diseases, *Suspension culture.

Offshore and estuarine oysters (120 of each group ranging from 42 to 87 mm length) were suspended at two levels in plastic mesh 'Vexar' bags. The rate of growth of oysters in terms of length was not significantly differnt for depth or for station between the two groups. The rate of growth in terms of weight was significantly greater for the estuarine oysters due to a significantly greater rate of growth for oysters at the lower level of that station. The condition index of oysters was higher at the estuarine station than offshore. The chlorophyll-a level in the estuary was twice that offshore, indicating a denser phytoplankton standing crop. However, generic composition of the phytoplankton was similar in both stations. Mortality was greater offshore (51 of 120) than at the estuarine station (32 of 120) and was possibly related to the greater incidence of the fungus Labyrinthomyxa marina in the offshore oysters. The problems of adequately containing oysters, obtaining spat and securing disease free oysters must be dealt with before an adequate assessment can be made for using petroleum platforms to culture oysters offshore. (EIS - Katz)
W79-01024

THE TOXIC EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL AND THREE AROMATIC HYDROCARBONS ON THE BEHAVIOR AND SURVIVAL OF BARNACLE LARVAE,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
R. Blundo.
Contributions in Marine Science, Vol. 21, p 25-37, 1978. 1 tab., 9 fig, 13 ref.

Descriptors: *Crustaceans, *Toxicity, *Mortality, *Oil, *Bioassay, *Toxins, *Animal behavior, Organic compounds, Invertebrates, Laboratory tests, Water pollution sources, Larvae, Oily water, Oil pollution, *Barnacles, Balanus eburneus, *Naphthalene, *Toluene, *Benzene, *Phototactic behavior, *Fuel oil, *Sublethal effects.

Freshly released nauplii of Balanus eburneus were exposed to test solutions of Exxon fuel oil, naphtahlene, benzene, and toluene, in sea water. After 1 hour those larval actively swimming were separated from those resting on the bottom;; all larvae were counted. In other experiments mortalities were determined by vital staining with neutral red. All substances were most harmful when used immediately after preparation. The fuel oil was much less harmful after it had been to air for 3 days. In 1 hour experiments, half the larvae continued swimming at dilutions of stock solutions as follows: No. 2 fuel oil 12.5%, naphthalene 15%, toluene 12.5%, benzene 11%. The results were indicative of interference with swimming and phototactic behavior. Mortalities in 1-hour experiments did not exceed 13%. From the results it is concluded that volatile aromatics including maphthalene, toluene, and benzene, are responsible for much of the deleterious effects on activity and survival of barnacle larvae. (EIS - Katz)
W79-01025

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEWATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
J. G. T. Carter, and W. L. Nichols.
Australian Journal of Marine and Freshwater Research, vol. 29, p 299-309, 1978. 3 fig., 4 tab., 16 ref.

Descriptors: *Absorption, *Zinc, *Larvae, *Toxicity, *Bonding, Analytical techniques, Path of Pollutants, Metals, Larval Growth Stage, Bioassay, Zinc Radioisotopes, Radioisotopes, Metabolism, Heavy metals, Chemical properties, Aquatic insects, *Simulium, *Bioaccumulation.

The uptake and loss of zinc by the aquatic larvae of the blackfly S. ornatipes was investigated using radioactive 65Zn. Larvae may absorb significant quantities of zinc from solution, and a substantial proportion remains in the body when larvae are transferred to zinc-free water. Uptake is assisted by metabolism, but an increase of the calcium ion concentration, although reducing toxcity, has no effect on uptake exchange or the loss of zinc. Larvae may be fractionated into 'cuticle', 'high-' and 'low-molecular-weight' fractions, based on solubility in water and 80% (v/v) ethanol. In the cuticle and high-molecular-weight fractions two 'pools' may be identified by dialysis against Na(3) EDTA- a pool in which zinc is weakly held and exchanges rapidly with the zinc in solution, and on where zinc is held and exchanges rapidly with the zinc in solution, ad one where zinc is held and exchanges slowly. Exposure time, temperature, and external concentration influence the quantity of zinc entering these pools. Washing the cuticle and high-molecular-weight fractions with a series of buffers suggests that zinc is bound by phenolic groups in the cuticle fraction, and by phosphonic acids in the high-molecular-weight fracton. Sulfhydryl groups did not bind a major portion of the zinc. (EIS-Katz)
W79-01026

BIOLOGICAL CONTROL AGENTS OF SEWAGE BACTERIA IN MARINE HABITATS,
New South Wales Univ., Kensignton, Australia. School of Microbiology.
M. M. Roper, and K. C. Marshall.
Australian Journal of Marine and Freshwater Research Vol. 29, p 335-343, 1978. 1 tab, 7 fig, 12 ref.

Descriptors: *Biocontrol, *Biological communities, *Aquatic microorganisms, *Sewage effluents, *Succession, *E. coli, *Marine bacteria, Myxobacter, Aquatic bacteria, Distribution patterns, Predation, Populations, Parasitism, Water pollution effects, Domestic wastes, Aquatic microbiology, Vexillifera, Polyangium, *Bdellovibrios.

The introduction of Escherichia coli into natural seawater results in a direct response from the natural microbial parasites and predators, which increase in number and rapidly destroy the alien coliform bacteria. In a predictable successional sequence, the decline in numbers of E. coli was followed by a reduction in the parasite and predator populations resulting from the absence of suitable host organisms and from predation by larger protozoa. E. coli numbers declined more rapidly in seawater taken from near a sewage outlet, because the parasites and predators were enriched by the constant availability of host organisms. A slower rate of decline of E. coli numbers in seawater samples taken further from the outlet was attributed to lower initial populations of parasites and predators. Two common marine predators of E. coli, a fruiting myxobacter (Polyangium) and a small amoeba (Vexillifera), have been characterized. (EIS-Katz).
W79-01027

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
M. L. Hattula, J. Sarkka, J. Janaiunen, J. Passivirta, and A. Roos.
Environmental Pollution, Vol. 17, p 19-29, 1978. 2 fig, 3 tab, 31 ref.

Descriptors: *Mercury, *Path of pollutants, *Absorption, *Food chains, *Freshwater fish, *Commercial fish, Heavy metals, Water pollution sources, Food webs, Public health, Size, Industrial wastes, Pulp wastes, Smelts, Pikes, Analytical techniques, *Lake Paijanne(Finland), *Bioaccumulation.

The total mercury and methyl mercury contents of freshwater fish from Lake Paijanne, Finland, are studied. This is the second largest lake in Finland and has been quite heavily contaminated by mercury. The fish from the limnologically cleanest areas had the largest concentrations of mercury. Twelve species of fish (1774 analyses of total mercury and 157 of methyl mercury) were analysed during a four-year period. Total mercury was measured by flameless atomic absorption and by gas-liquid chromatography. The average mercury concentration for all fish was 0.65 mg/kg on a fresh weight basis, of which 98.7% was in a methylated form. The concentration of mercury in fish differed in different parts of the lake and also depended on the weight of the fish. (EIS-Katz)
W79-01028

CHLORINATED HYDROCARBONS AND MERCURY IN AQUATIC VASCULAR PLANTS OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
J. Sarkka, M. L. Huttula, J. Janatuinen, and J. Paasivirta.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 361-368, 1978. 1 fig, 5 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, *Mercury, *Pesticide residues, *Aldrin, *Plant tissues, Chlorinated hydrocarbon pesticides, Plant physiology, Plant populations, Food webs, Metals, Heavy metals, DDE, Pesticide kinetics, Gas chromatography, Path of pollutants, *Tissue analysis.

This is part of a study of the chlorinated hydrocarbons and mercury residues in the food webs of the lake. Data was collected to research differences in the residue levels between the regions of the lake, years, and species and trophic levels. A temporal decrease in the plant concentrations of PCB and

total DDT (DDT and metabolites) was correlated with decreased utilization of these compounds in the region. Of the chlorinated hydrocarbons, PCB was present in the highest concentrations. Data was presented on temporal trends, regional differences and species concentrations. (EIS-Deal)
W79-01029

CHANGES IN SUBMERGED AQUATIC MACROPHYTE POPULATIONS AT THE HEAD OF CHESAPEAKE BAY, 1958-1975,
Florida Univ., Gainsville, FL. Dept. of Environmental Engineering Sciences.
S. Bayley, V. D. Stotts, P. F. Springer, and J. Steenis.
Estuaries, Vol. 1, No. 3, p 73-84, September 1978. 2 tab, 6 fig, 40 ref.

Descriptors: *Chesapeake Bay, *Plant populations, *Submerged plants, *Succession, Aquatic plants, Turbidity, Salinity, Environmental effects, Waterfowl, Biological communities, Distribution patterns, *Susquehanna Flats(Maryland), *Species diversity, *Milfoil, Eurasian milfoil.

Submerged aquatic plant populations in the Susquehanna Flats of the Chesapeake Bay were followed for 18 years. An exotic species, eurasian water milfoil, Myriophyllum spicatum, increased dramatically from 1958 to 1962; at the same time the dominant native species declined. After 1962, milfoil populations declined and the native rooted aquatics gradually began to return to their former levels. In the late 1960's all species declined and in 1972 almost disappeared from the Susquehanna Flats. These fluctuations may have been related to several interrelated environmental factors in the Chesapeake Bay, including tropical storms, turbidity, salinity, and disease. The utilization of the Susquehanna Flats by waterfowl appears to be related to the abundance and species composition of the submerged macrophytes present. (EIS-Katz)
W79-01030

EFFECTS OF CHROMIUM ON SOME AQUATIC PLANTS,
Environmental Assessment Council, Inc., New Brunswick, NJ.
J. Mangi, K. Schmidt, J. Pankow, L. Gaines, and P. Turner.
Environmental Pollution, Vol. 16, p 285-291, 1978. 4 fig, 8 ref.

Descriptors: *Plant growth, *Adsorption, *Toxicity, *Algae, *Chromium, Bioassay, Mortality, Pollution abatement, Water pollution effects, Industrial wastes, Laboratory tests, Growth rates, Aquatic plants, Aquatic life, Environmental effects, *Pennsylvania, *Susquehanna River(Penn), *Duckweed, Lemna, *Spirodella.

The effect of chromium on algae and duckweed from the upper Susquehanna river was determined. Duckweed was exposed to chromium in concentrations from 0.003 to 10 ppm and algae was exposed to concentrations from 0.01 to 10 ppm. The growth of all plants was inhibited by 10 ppm chromium. The uptake of chromium varied linearly with the concentration of chromium present. At higher levels of chromium, the ratio taken up by the plants to the concentration in the initial medium was not as great as at lower levels. It is possible that through adsorption of chromium on their cell walls, benthic and planktonic algae may remove a relatively large load of the heavy metal from the water. Such a mechanism would be partially responsible for cleansing polluted rivers of the heavy metal. (EIS-Katz)
W79-01031

IN VITRO CHANGES IN THE ACTIVITY OF ATPASES IN THE GILLS OF CARCINUS MAENAS EXPOSED TO VARIOUS CONCENTRATIONS OF P,P'-DDT,
Plymouth Polytechnic, (England)
P. E. Jowett, M. M. Rhead, and B. L. Bayne.
Environmental Pollution, Vol. 17, p 1-6, 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *DDT, *Animal physiology, *Inhibitors, *Crabs, *Biological membranes, *Enzymes, Water pollution effects, Chlorinated hydrocarbon pesticides, Invertebrates, Crustaceans, Pesticides, Metabolism, Laboratory tests, Ion transport, *Carcinus, *ATPase.

Enzyme preparations of gill homogenates from the shore crab (Carcinus maenas) were exposed to concentrations of p,p'-DDT in ethanol (95%), ranging from 10-10 M to 10-15 M DDT. The specific activities of Mg+2-ATPase, Na+, K+-ATPase and Total (Na+, K+, Mg2+)-ATPase were assayed. Mg2+-ATPase activity was inhibited at all concentrations of DDT. Na+, K+-ATPase was slightly stimulated at all concentrations. The activity of Total-ATPase was unaffected at the lower concentrations but was inhibited at higher concentrations. (EIS-Katz)
W79-01032

THE EFFECT OF TEMPERATURE ON THE DEVELOPMENT OF DIAPAUSING AND SUBITANEOUS EGGS IN SEVERAL FRESHWATER COPEPODS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Cooley.
Crustaceana, Vol. 35, No. 1, p 27-34, 1978. 2 tab, 2 fig, 17 ref.

Descriptors: *Copepods, *Water temperature, *Zooplankton, *Seasonal, Hatching, Environmental effects, *Diapause, Temperature, Growth stages, Life cycles, Animal physiology, Environmental effects, Aquatic animals, Crustaceans, Invertebrates, *Cyclopoids, *Diaptomids, *Egg development.

Subitaneous egg development was measured at 5 to 7 temperatures using freshly caught zooplankton from two cyclopoids and two diaptomids. Development time for first naupliar instars of the 2 diaptomids were also estimated. Diapausing eggs were estimated and exposed to a number of temperature and light treatments. Egg development times in the 2 calanoids are similar at temperatures from 14 to 23C but are grossly different at cooler temperatures. NI development times are very similar for both diaptomids even at 4C, a temperature that this instar never experiences. The hatching response of resting eggs incubated in the laboratory at 4C supports the idea that Leptodiaptomus minutus is adapted to a winter existence and Aglaodiaptomus spatulocrenatus to warmer water. In many cyclopoid species it appears as though the diapause stage and subsequent emergence of the copepodids from the mud is crucial for continuation of the species since there may be a total absence of overwintering instars. (EIS-Katz)
W79-01033

GULL DROPPINGS AND THEIR EFFECTS ON WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W79-01041

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W79-01046

EFFECT OF COPPER AND TRI- AND HEXAVALENT CHROMIUM ON THE WORK OF AN ACTIVATED SLUDGE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
For primary bibliographic entry see Field 5D.
W79-01079

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
S. J. Souza.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 831, Price code: A10 in paper copy, A01 in microfiche. MS Thesis, 198 p, 48 fig, 62 tab, 1277 ref. OWRT A-043-NJ, (3).

Descriptors: *Reservoirs, *Eutrophication, Watershed management, Trophic level, Phosphorus, Pumped storage, *Land use, *New Jersey, *Six Mile Run Reservoir(NJ), Water pollution effects, *Nutrient loading models, *Trophic potential, Chlorophyll 'a'.

Six Mile Run Reservoir, a 23.96 x 106m3 pumstorage facility,is slated for construction in Franklin Township, N.J. The reservoir will serve a recreational and water supply function. Concern was generated over the possible accelerated eutrophication of the reservoir. In many cases, poor land use management in a lake or reservoir drainage basin can lead to a significant decrease in water quality and recreational utilization (Tuffey and Baker, 1975). Although yet in the planning stages, the trophic effect resulting from improper land use on Six Mile Run Reservoir could be investigated. Due to its limiting nature in most freshwater systems, phosphorus was considered the nutrient which would control the rate of eutrophication. It was necessary to assess existing and future phosphorus loads in relation to land use and predict the trophic potential. The existing phosphorus load was obtained following a year-long sampling program at five stations during steady state, background, and storm conditions. Relationships between phosphorus, suspended solids, and flow were investigated. Future loads were calculated through the land use-phosphorus input method of Uttormark, et al (1974). The trophic potential of existing and future loads was predicted with the empirical model of Dillon (1974b). An additional empirical model (Dilon and Rigler, 1974A) was employed to convert predicted spring total phosphorus concentrations to peak summer chlorophyll 'a' concentrations. Trophic potential and chlorophyll 'a' data for Six Mile Run Reservoir were compared to similar data generated for other New Jersey lakes and impoundments. The effects of land use, phosphorus loading, and trophic response were discussed in relation to the water quality and recreational utilization of the reservoir. Some solutions to predicted excessive phosphorus loading stimulated by improper basin managment were presented.
W79-01086

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
F. R. Trainor, and L. G. Harter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 642, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, 1978. 11 p, 1 tab, 4 fig, 23 ref. OWRT A-075-CONN(1), 14-34-0001-8007.

Descriptors: *Algae, *Carrying capacity, Computer programs, Laboratory tests, Sewage treatment, *Connecticut River, Bioassay, Waste assimilative capacity, *Bialgal assay, *Secondary effluent effects, Algal interactions, Golenkinia sp., Cyclotella meneghiniana, Oscillatoria sp.

A bialgal assay has been developed which can be used in municipal or industrial laboratories to measure the carrying capacity of the Connecticut River. The selection of the green alga, Golenkinia sp., and the diatom, Cyclotella meneghiniana, enables the assay to be practicable throughout the year. Initial cell numbers in the inocula are critical concerning the outcome of algal interactions. The effect of secondary effluent in small amounts stimulates the green algal population. The addition of more secondary effluent favors the growth of diatoms. The increased amount of secondary effluent permits a proliferation of diatom species in con-

junction with a slower rate of algal succession. A trialgal assay employing the blue-greenalga, Oscillatoria sp., can work during summer pollution seasons. Oscillatoria sp., a temperature dependant alga, can operate in laboratory assay comparable to nature during late summer - early fall periods.
W79-01089

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN.
Purdue Univ., Lafayette, IN. Dept. of Entomology.
W. P. McCafferty.
The Great Lakes Entomologist, Vol. 11, No. 1, p. 37-43, 1978. 1 fig, 2 tab, 5 ref. USEPA G005103.

Descriptors: *Aquatic insects, *Assessment, *Soil conservation, Crustaceans, Erosion pollutants, Invertebrates, *Indiana, *Pre-management, *Watersheds(Basins), Macroinvertebrates, Maumee Basin(Ind), Lake Erie Basin(Ind), Black Creek watershed(Ind).

In order to establish baseline data adjunct to the research and development of soil conservation practices for sediment reduction in the Maumee River and Lake Erie, the aquatic macroinvertebrates of Black Creek and adjacent areas in northeastern Indiana were studied from 1974-1975. A total of 90 species of Insecta and Crustacea were taken, 69 from Black Cree. Species diversity indices ranged from 1.04 to 2.75 in two downstream locations and were generaly reflective of stressed conditions related to channelization and sedimentation from the agrarian drainage area. Benthic species from the adjacent Maumee River potentially contribute in part to population maintenance in Black Creek.
W79-01096

EXCEPTIONAL TOLERANCE TO LOW PH OF SOME TROPICAL BLACKWATER FISH,
The Pennsylvania State Univ., Dept. of Biology.
W. Dunson, F. Swarts, and M. Silvestri.
Journal of Exceptional Zoology Vol 201 No 2, p 157-162, August, 1977. 4 fig., 1 tab., 20 ref. OWRT A-042-PA(2). 14-34-0001-6039.

Descriptors: *Fish, *Hydrogen ion concentration, *Rivers, Sodium, Tropical Blackwater fish, *Blackwater River, *Acid treatment, Guppies, Tetras, Ion balance, Gill, Skin, Kidney.

Cardinal, neon, and emperor tetras (Cheirodon axelrodi, Hyphessobrycon innesi, Nematobrycon palmeri), small South American characin fish often found in acidic blackwater rivers, have an unusual tolerance to sulfuric acid solutions of low pH. Most cardinal tetras with stand immediate transfer to water at pH 3.5 for an indefinite period. With gradual adjustment to further stepwise lowering of the pH, one individual survived at a pH of 3.1 for five weeks. This is by far the most acidic solution known to be tolerated for extended periods by any fish. The lower incipient lethal level (for 50% survival) is estimated to be about 3.35 for neon and cardinal tetras. On the other hand, common guppies (Poecilia reticulata), a species generally considered to be highly resistant to environmental change, all died after 11 days at pH 4.75. Both guppies and tetras lose large amounts of body sodium on exposure to lethal pH's. (Sink - Penn. State)
W79-01098

OXIDATION-REDUCTION CHEMISTRY AND AQUEOUS AMMONIUM OXIDATION IN THE ESTIMATION OF NITRATE BY THE CADMIUM REDUCTION METHOD,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01100

HEAVY METAL ACCUMULATION AND ITS EFFECT ON THE BIOTA OF AN INDUSTRIAL SETTLING POND,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5D.
W79-01124

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
L. M. Games, and J. M. Hayes.
In 'Environmental Biogeochemistry', Vol 1. Carbon, Nitrogen, Phosphorus, Sulfur and Selenium Cycles, edited by Jerome Nriagu. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan. Chapter 5, p 51-73, 1976. 4 fig, 4 tab, 32 ref. NGR 15-003-118.

Descriptors: *Methane, *Carbon dioxide, *Anaerobic bacteria, Methane bacteria, Sludge digestion, Water pollution, Organic materials, Landfills, Sewage sludge, Anaerobic conditions, Biogeochemistry.

Methane and carbon dioxide produced in the anaerobic decay of organic matter as found in conditions of a sanitary land fill are involved in the potential pollution of the groundwater. The isotopic compositions of CO2 and CH4 are metabolically interrelated, but this relationship is complicated by involvement of acetate. Because methane can arise from acetate or CO2, and CO2 itself can be produced from acetate and other molecules, no simple relationship can be discerned in complex environments. The various environments considered show different fractionation factors for CO2 and CH4 and also for each as they relate to the organic matter. These differences are apparently a result of changes in the microbial ecology in response to changes in the type and availability of nutrients. This can be concluded from the results of the laboratory reactor operated as a closed system, insofar as the experiment approximated the changing conditions observed when organic matter is utilized in the natural environment. (Wiersma-Purdue)
W79-01135

LIMNOLOGICAL CHARACTERISTICS OF THE POTOMAC ESTURY,
Corvallis Environmental Research Lab., OR.
N. A. Jaworski.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 402-425. 3 fig, 4 tab, 10 ref.

Descriptors: *Potomac estuary, *Estuaries, *Limnology, *Water pollution effects, *Eutrophication, *Nutrients, Phosphorus, Potomac River, Rivers, Trophic level, Waste water disposal, Dissolved oxygen, Nuisance algae, Water pollution sources, Vollenweider models, Domestic wastes, Municipal wastes, Mathematical models, River basins, District f Columbia, Maryland, Virginia.

Eutrophication of the Potomac Estuary, much more pronouced than in other North Atlantic Coast estuaries, is primarily due to domestic wastewater discharges from the metropolitan Washington, D.C. area. Trophic conditions include high coliform counts, Low dissolved oxygen, and nuisance algal growth. Current phosphorus loading rates are 89.6g/sq myr for the upper estuary, 17.4 for the upper and middle, and 5.0 for the upper, middle, and lower. Application of Vollenweider's plot of critical phosphorus loadingas a function of mean depth/hydraulic residence time indicates the estuary has a much higher nutrient-assimilating capacity than lakes, and can tolerate a high trophic state because it is a well-mixed system. Loading concepts appear applicable to the estuary, although higher excessive and permissible loadings must be specified. Critical phosphorus loadings compare favorabel with estimates derived from historical data and mathematical modelling efforts. The Potomac River basin which includes the estuary isthe second largest in the MIddle Atlantic States, with a drainage area of 38,000 sq km and about 3.3 million population. The upper basin is largely rural. Land use in the basin is estimated at 55% forest, 40% agricultural, and 5% urban. Analysis of the estuary is complicated by salinity and light-limiting conditions. (See also W78-12895) (Lynch-Wisconsin)
W79-01195

OBSERVATIONS ON ALGAL POPULATIONS AND EXPERIMENTAL MATURATION POND SYSTEM,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W79-01196

FRESH-WATER WEEDS ARE A RESOURCE,
Rothamstead Experimental Station, Harpenden, (England).
N. W. Pirie.
Appropriate Technology, Vol. 4 No. 4, p 15-17, February 1978. 21 ref.

Descriptors: *Aquatic weeds, *Beneficial use, *Water hyacinth, *Nutrient removal, *Harvesting, *Feeds, *Tertiary treatment, *Sewage treatment, Eichhornia crassipes, Nutrients, Fertilizers, Food, Proteins, Methane, Fiber crops, Pulp and paper industry, Fish farming, Biocontrol, Nitrogen, Phosphorus, Eutrophication, Forages, Aquiculture, Manatees.

Beneficial uses of aquatic weeds are discussed, especially uses of water hyacinth (Eichhornia crassipes). Besides nutrient removal in tertiary sewage treatment systems, aquatic weeds can provide sources of: (1) fertilizer; (2) feed or fodder for pigs, cattle, water buffalo, sheep, ducks, and fish;(83) methane (biogas);(83) methane (biogas); 84) fiber for making pper and cardborad; (5) pharmacologically active extracts; (6) protein; and (7) human food. Floating weeds such as water hyacinth depend entirely on nutrients in the water, and it is estimated that one hectare can yield 0.5 tons per day of dried weed in warm weather. With an average composition of 3% nitrogen and 0.3% phosphorus, and assuming an average daily yield over a year of 0.15 ton, a year's harvest would produce one ton of nitrogen and 0.1 ton of phosphorus, or enough fertilizer for 3-4 hectares of arable land. Mechanical harvesting is complicated by the 10 tons of water accompanying each half-ton of dry matter. While feeding acceptance of hyacinth by pigs and cattle is not a problem, its nutritional value remains uncertain. Some protein can be extracted with difficulty from hyacinth and the partly dried press-cake waste can provide raw material for paper-making. Disintegrated leaves can be used as feed in fish farming. other potentially useful weeds are nile cabbage (Pistia), the floating ferns Salvinia and Azolla, duck-weed (lemna), Wolffia, and water spinach (Ipomaea aquatica). (Lynch-Wisconsin)
W79-01197

QUANTITATIVE AND QUALITATIVE CHANGES IN THE PHYTOPLANKTON OF LAKE KINNERET, ISRAEL, 1972-1975,
Israel Oceanographic and Limnological Research Ltd., Haifa.
U. Pollingher, and T. Berman.
Oikos, Vol. 29, No. 3, p 418-428, 1977. 7 fig, 5 tab, 28 ref.

Descriptors: *Lake Kinneret(Israel), *Phytoplankton, *Peridinium cintum westii, *Succession, *Photosynthesis, *Standing crops, Seasonal, Israel, Lakes, Algae, Chlorophyll, Eutrophication, Biomass, Chloropyta, Cyanophyta, Species composition, Primary productivity, Droughts, Detritus, Food webs, Zooplankton, Nutrients, Metabolism,

Water level fluctuations, Water supply, Dinoflagellates.

Nutrients or factors other than light limited phytoplankton growth and resulted in a dramatic decline in the standing crop of the boom dinoflagellate peridinium cinctum fa. westii between 1972-75 in Lake Kinneret, Israel. Changes observed during weekly and biweekly sampling suggest a trend away from a detrital food web dominated by Peridinium to a pattern of greater zooplankton grazin. Between 1972-75 algal standing crop declined from an annual average of 80.5 g/sq m to 40 g/sq m. The change was paticularly evident during the Peridinium bloom period, and was caused by a decrease both in cell number and size. The relative proportion of small Chlorophyta and Cyanophyta increased over the period, with cyanophyte increase especially notable in late summer and fall. Chlorophyll concentration did not correspondingly decrease, however, because of a general increase in cellular chlorophyll content F. Primary production likewise did not decline, despite the fall off in algal biomass as fresh weight, because of the shigt to more rapidly metabolizing species. As a result, assimilation numbers, turnover times, and algal growth rates were higher than between 1969-72. Lake Kinneret, the only freshwater lake in Israel, serves as the principle reservoir for the national water supply system, and is classified as relatively eutrophic. During the study period a sereis of dry winters, beginning with the drought of 1972-73, resulted in low fall water levels and changes in hydromechanics and water chemistry. (Lynch-Wisconsing)
W79-01198

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
R. J. Dobosy, and D. D. Houghton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 383, Price codes: A09 in paper copy, A01 in microfiche. Final Project Report, March 1977. 161 p, 22 fig, 3 tab, 42 ref. NOAA 04-4-022-33, NSF ATM 75-03617.

Descriptors: *Shores, *Simulation analysis, *Turbulence, *Mixing, *Air pollution, *Dispersion, *Lake Michigan, Fallout, Model studies, Waukegan(IL), Illinois, Great Lakes, Lakes, Fumigation, Mathematical models, Equations, Pollutants, Water pollution sources, Air-water interfaces, Lake breezes, Winds, Air circulation, Plumes, Nearshore zone, Diffusion.

Dispersion of contaminants in the nearshore of Lake Michigan was investigated using numerical solution of budget equations for mass, momentum, and potential temperature. Wind and stability patterns, and turbulent mixing, were simulated as dispersants in a two-dimensional vertical plane model, with shoreline fumigation as the regime. Turbulence was simulated using schemes from levels two and three of the hierarchy of Mellor and Yamada. Turbulence simulation with a one-dimensional model using level three (which includes nonlocal effects) was verified with data from day 34 of the Wangara expedition. Difficulties encountered in data agreement appeared due to atmospheric processes such as horizontal advection not well simulated by the one-dimensional model. Data from offshore of Waukegan, Illinois for 28 June 1974 were used to compare levels two and three. Predicted mixed layer depth over land was much less than observed at Waukegan using either turbulence scheme, due apparently to three-dimensional features of the actual situation, not to inadequacies of the simulation. Predictions from level two, a simpler and purely local scheme, were comparable to level three for both pollutant concentration and mixed layer depth with winds of about three m/s, except within 500 m of the shore and a short distance above the inversion base. Level three was preferable, however, because of its greater generality and smoother predicted fields. (Lynch-Wisconsin)
W79-01199

PERSISTENT BLOOMS OF SURF DIATOMS ALONG THE NORTHWEST COAST,
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 373, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. WSG-TA 77-3, presented to Oregon State University Symposium on 'The Marine Plant Biomass of the Pacific Northwest Coast', March 1977. 21 p, 8 fig, 13 ref. NSF-OCE-76-20155.

Descriptors: *Pacific Northwest U.S., *Nutrients, *Surf diatoms, *Eutrophication, *Aquiculture, *Pacific Coast Region, *Chaetoceros armatum, *Asterionella socialis, *Beneficial use, Surf, Diatoms, Coasts, Oceans, Algae, Phytoplankton, Washington, Oregon, Razor clams, Clams, Nitrates, Limiting factors, Salinity, Water temperature, Beaches.

Along parts of the Washington-Oregon Pacific coastline where sandy beaches predominate (especially between Tillamook Head, Oregon, and Grenville, Washington), algal populations are dominated by surf diatoms. These diatoms, at present mostly Chaetoceros armatum, a centric diatom, and Asterionella socialis, a pennate diatom, constitute a high algal biomass with a rapid growth rate which could provide a living food supply for aquaculture of bivalve molluscs such as razor clams. Razor clam and surf diatom abundance coincide along the beaches, and clam gut contents are composed almost entirely of the two diatom species. Razor clams in turn recycle nutrients needed by the diatoms, including the major source of regenerated nitrogen, ammonium. Surf diatom blooms are notable for two unique features: (1) the blooms are composed of only two significant species, and (2) blooms are persistent, and are usually present and most abundant throughout autumn-early spring, and less dense or absent during summer, in contrast to other phytoplankters or seaweed. Surf diatom populations have been monitored at Copalis Beach, Washington 1971-76. While neither phosphate nor silicate are limiting during summer, nitrate is depleted in surf samples by late April due to spring phytoplankton blooms (especially Thalassiosira pacifica) in upper inshore waters beyond the breaker zone. Nitrate reintroduction depends on upwelling and river drainage. (Lynch-Wisconsin)
W79-01200

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME II: MATERIALS AND METHODS/RESULTS AND DISCUSSION,
Louisiana Agricultural Experiment Station, Baton Rouge.
R. P. Gambrell, R. A. Khalid, M. G. Verloo, and W. H. Patrick, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 469, Price codes: A07 in paper copy, A01 in microfiche. Contract Report D-77-4, Army Engineers Waterway Experiment Station, Vicksburg, Mississippi, May 1977. 309 p, 92 fig, 29 tab, 75 ref, 17 append. DACW39-74-C-0076.

Descriptors: *Gulf of Mexico, *Heavy metals, *Nutrients, *Oxidation-reduction potential, *Hydrogen ion concentration, *Dredging, *Sediments, *Dredge spoils, *Waste disposal, *Gulf Coast, Plant growth, Sediments, Rivers, Bays, Mercury, Lead, Cadmium, Zinc, Copper, Manganese, Iron, Phosphorus, Ammonium.

The chemical form and distribution of various trace metallic elements are all differently influenced by pH and oxidation-reduction (redox) potential in coastal Gulf of Mexico dredged sediments. One study determined how pH and redox changes during dredging and disposal affects chemical availability of mercury, lead, cadmium and other elements as plant nutrients and sediment toxins. A second study measured pH and redox effects on sediment capacity to retain high levels of added toxic materials. Mercury was not greatly influenced by pH change and redox intensity except under strongly reduced acidity and oxidized mild alkalinity. Lead was affected less by redox than pH, but was strongly associated with the reducible phase (hydrous oxides) and recovered in this form with increasing redox. Unlike mercury and lead, cadium release was favored by redox, particularly at pH 5.0 and 6.5. Dredged material dumped in open water undergo little redox change before they settle to the bottom and again become reduced sediment materials. But where dredging wastes are disposed upland, gradual drainage and subsequent oxidation may occur over time with changes in pH mediated by redox potential affecting metal availability. Affects of pH and redox on the hydrochemistry of iron, manganese, zinc, copper, phosphorus and ammonium-nitrogen are also discussed. (Lynch-Wisconsin)
W79-01201

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
E. W. Chesebrough, and A. J. Screpetis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 757, Price codes: A04 in paper copy, A01 in microfiche. February 1976. 71 p, 15 fig, 13 tab, 35 ref, 2 append.

Descriptors: *Quaboag Pond(MA), *Quacumquasis Pond(MA), *Eutrophication, *Waste water disposal, *Trophic level, Nutrients, Massachusetts, Limnology, Ponds, Water temperature, Dissolved oxygen, Water pollution effects, Primary productivity, Phytoplankton, Algae, Limiting factors, Depth, Macrophytes, Zooplankton.

Despite adequate nutrient concentrations in Quaboag Pond, phytoplakton production is extremely low and aquatic macrophytes are sparse; nearby Quacumquasit Pond is early-mesotrophic, with some evidence of eutrophication in the form of late summer bottom anaerobicity and summer presence of cyanophytes, but surface waters are clear and of good quality. Quaboag Pond water is likewise of good quality, except for high color content. Possible uptake of a micronutrient by macrophytes in the East Brookfield River may account for low productivity in Quaboag Pond. A wastewater treatment plant is located 4.5 miles upstream of the pond on a tributary of the river. Water quality data indicate neither phosphorus nor nitrogen is a limiting nutrient in Quaboag Pond. The two ponds are connected by a short stream which normaly flows from Quacumquasit to Quaboag Pond, but which during high water has been observed to reverse itself. Though Quaboag Pond has more than twice the area of Quacumquasit (531 vs 218 acres), the latter is far deeper (5.9 vs 32.5 ft mena depth). Quacumquasit Pond suports greater diversity and relative abundance of phytoplankton and zooplakton than does Quaboag. Heavy macrophyte growth, espcially water marigold, on the connector stream may act as a buffer in removing nutrients. (Lynch-Wisconsin)
W79-01202

ADDITIONS TO THE FRESHWATER ALGAE OF SOUTH CAROLINA,
Charleston Coll., SC.; and South Carolina Wildlife and Marine Resources Dept., Charleston.
A. K. Goldstein, and J. J. Manzi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 193, Price codes: A02 in paper copy, A01 in microfiche. Journal of the Elish Mitchell Scientific Society, Vol 92, No 1, Spring 1976, p 9-13. 15 ref.

Descriptors: *South Carolina, *Algae, *Ponds, *Floral lists, *Phytoplankton, *Periphyton, Prawns, Macrobrachium rosenbergii, Aquiculture, Fish farming, Benthic flora, Chlorophyta, Chrysophyta, Cyanophyta, Euglenophyta, Pyrrophyta, Rhodophyta, Classification.

A survey of algal flora in two fish culture ponds in South Carolina used for grow-out of the giant freshwater prawn, Macrobrachium rosenbergii, conducted May-November 1975 resulted in identification of 259 taxa, among which 112 spcies and 19 genera are believed to be new records for the state. The ponds studied were: (1) a small (0.015 ha), shallow (0.25-1.0 m deep), relatively old pond with well-established vascular flora lining sides and bottom, located 180 km from the coast in the piedmont at the Styx Hatchery, Cayce, Lexington County; and (2) a larger (0.2 ha), shallow (0.-1.7 m deep), Relatively new pond with little vascular flora, located about 50 km inland at the Dennis Wildlife Center, Bolnneau, Berkeley County. Samples were collected semi-monthly for phytoplankton and periphyton, the latter by means of slides submerged in the shallow, mid-depth, and deep ends of each pond. Of the 259 taxa identified, 146 were Cholorphyta, 46 Cyanophyta, 45 Chrysophyta, 1 Pyrrophyta, nine Euglenophyta, and one Rhodophyta. Numerous Cryptophytes of the genus Cryptomonas were noted, but none were identified to species. Among Chrysophyta, 38 species were in the class Bacillariophyceae, four in Xanthophyceae, and three in Chrysophyceae. A complete list of all taxa is given. (Lynch-Wisconsin)
W79-01203

POLYHALOGENATED 1-OCTENE-3-ONES, ANTIBACTERIAL METABOLITES FROM THE RED SEAWEED BONNEMAISONIA ASPARAGOIDES,
Scripps Institution of Oceanography, La Jolla, CA.
O. J. McConnel, and W. Fenical.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 818, Price codes: A02 in paper copy, A01 in microfiche.
Tetrahedron Letters, 1977, No. 2, p 1851-1854. 1 tab, 8 ref. SG-04-3-158-22.

Descriptors: *Bonnemaisonia asparagoides, *Antibacterial substances, *Seaweeds, *Bacteria, *Staphylococcus auresus, *Polyhalogenated 1-octene-3-ones, Metabolites, Algae, Delisea fimbriata, Ptilonia australasica, Sea grasses, Biochemistry, Metabolism, Spain, Mediterranean Sea, Seas, Acetates, Halogens.

Extracts of the red seaweed Bonnemaisonia asparagoides do not contain polyhalogenated 2-heptanones as expected, but instead contain five closely related bromine- and chlorine-containing 1-octene-3-ones. Each shows significant antibacterial activity toward Staphylococcus auresus. Specimens of B. asparagoides were collected along the Mediterranean coast near La Escala, Spain. The polyhalogenated 1-octene-3-ones reported here, and those recently isolated from two Australian relatives of B. asparagoides (Delisea fimbriata and Ptilonia australasica), as well as the Delisea C9 lactones, have a common origin in acetate-derived precursors. Polyhalogenated nona-2,4-diones (with hydroxylation at C-6 for some of the lactones) undergo base-induced Favorsky reactions presumable analogous to reactions of haloacetones found in Asparagopsis sp. Favorsky reactions involving the C-2 carbonyl could, following decarboxylation and concommitant halogenation, yield the halo 1-octene-3 ones. Reactions involving the C-4 carbonyl could yield a C-4 carboxylate substituted n-octane skeleton which, through enolization of the remaining carbonyl toward C-1, could cyclize to give the Delisea lactones. It had been expected that the biologically active components in B. asparagoides would be related to the polyhalogenated 2- heptanones isolated from B. hamifera collected in the Gulf of California. (Lynch-Wisconsin)
W79-01204

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5B.
W79-01208

THE OKEFENOKEE SWAMP WATERSHED: WATER BALANCE AND NUTRIENT BUDGETS,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 2H.
W79-01211

NITROGEN ACCRETION, AND THE NATURE AND POSSIBLE SIGNIFICANCE OF N2 FIXATION (ACETYLENE REDUCTION) IN A NOVA SCOTIAN SPARTINA ALTERNIFLORA STAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
D. G. Patriquin, and C. R. McClung.
Marine Biology, Vol. 47, p 227-242, 1978. 11 fig, 3 tab, 52 ref.

Descriptors: *Salt marsh, *Nitrogen fixation, *Soil bacteria, Wetlands, Marshes, Anaerobic bacteria, Bacteria, Nitrogen, Rhizosphere, Marsh plants, Nova Scotia(Canada).

Total aboveground nitrogen accretion at a short Spartina alterniflora stand was estimated as 78 kg N/ha, compared to estimated N2 fixation on the mud surface of 22 kg N/ha, and subsurface N2 fixation of 93 kg N/ha. Subsurface N accretion was estimated to be of the order of 77 kg n/ha. Mudsurface ARA (acetylene-reducing activity) exhibited a pronounced mid-season maximum, while subsurface ARA exhibited a general trend of increase from May to September, and then a decline as a function of falling temperature. Various experiments suggest that mud-surface ARA was associated with non-heterocystous blue-green algae and photosynthetic bacteria, while subsurface ARA was associated with vital activity of S. alterniflora. Counts of various groups of bacteria indicated an enrichment of anaerobic and microaerophilic N2-fixing bacteria in the rhizosphere in comparison to non-rhizosphere soil. Root treatment with chloramine-t reduced total numbers of anaerobic and microaerophilic N2 fixers suggesting a relative enrichment of microaerophiles in the interior or 'endorhizosphere' of the roots. (Steiner-Mass)
W79-01214

THE INFLUENCE OF COLLOIDAL ORGANIC MATTER ON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
Limnology and Oceanography, Vol. 21, No. 5, p 684-696, September, 1976. 5 fig, 4 tab, 20 ref.

Descriptors: *Bogs, *Iron, *Phosphorus, *Organic matter, Wetlands, Michigan, Organic compounds, Anaerobic conditions, Organophosphorus compounds, *Colloidal organic matter, *Biologically active metals, Ferrous iron, Acid by lakes, North Gate Lake(Michigan).

The relationship between iron and phosphorus and the relationship of those elements of colloidal organic matter (COM) was studied in a meromictic acid lake. Bathophen anthroline (BPN) reactive ferrous iron existed in true solution, dialyzable, in constantly anaerobic monimolimnetic water; in the aerobic epilimnion reactive ferrid iron was of colloidal size. Intermediate depths, oxygenated only during spring, contained two forms of ferrous iron reactive to BNP: dialyzable ferrous iron (Fe(2+)) and colloidal Fe (II) which may have originated through in situ reduction of colloidal reactive ferric iron and may be present as a COM-Fe (2+) complex. The amount of COM influenced the fate of dialyzable Fe (2+) and dialyzable PO sub 4-P present in anaerobic strate before aeration. Aeration with soluble organic matter present (COM absent) resulted in the formation of colloidal nonreactive ferric iron and 65% colloidal PO sub 4-P while aeration with 26 mg/liter COM resulted in only 36% colloidal, nonreactive ferric iron and 19% colloidal PO sub 4-P. COM apparently masks the cationic properties of colloidal ferric iron and retards the formation of nonreactive Fe (III), allowing most of the PO sub 4-P to remain free in solution and biologically available. (Steiner-Mass)
W79-01219

INJURIOUS EFFECT OF TAP WATER ON ROOTING OF CUTTINGS OF BRYOPHYLLUM CALYCINUM,
Rockefeller Univ., New York.
W. J. Robbins, and A. Hervey.
Bull Torrey Bot Club. 99(5), p 248-249, 1972.

Descriptors: *Potable water, *Bryophyllum-calycinum, *Chlorine, *Copper, Cuttings, *Fluorine, Injurious, *Roots, *Toxicity, Water pollution effects.

Cuttings of B. calycinum root well in distilled water but poorly, if at all, in New York City tap water. Results of experiments suggest that Cu in New York City tap water is the main cause of its toxicity, but other substances including Cl, F and volatile or thermolabile materials may play a role.--Copyright 1973, Biological Abstracts, Inc.
W79-01221

PRODUCTION AND DYNAMICS OF EXPERIMENTALLY ENRICHED SALT MARSH VEGETATION: BELOWGROUND BIOMASS,
Marine Biological Lab., Woods Hold, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Teal, and N. Y. Persson.
Limnology and Oceanography, Vol. 21, No. 2, p 345-252, March, 1976. 3 fig, 2 tab, 28 ref.

Descriptors: *Productivity, *Salt marshes, *Vegetation, Marshes, Vegetation, Rooted aquatic plants, Roots, Rhizomes, Root development, Standing crops, Biomass, Fertilizers, Nutrients, Spartina alterniflora, Spartina patens.

Root growth increased during the early growing season in Spartina alterniflora salt marsh plots. While fertilization with nitrogenous fertilizer did not affect initial growth, a marked decrease in root biomass followed the spring peak particularly where nutrient doses were highest. A sharp reduction in roots occurred in enriched areas covered by S. patens, although, as with S. alterniflora, aboveground biomass increased. Root disappeared during autumn leaving only rhizomes to overwinter. Maximum standing crop for roots was 0-2 cm deep, for rhizomes 2-5 cm. Net annual underground production was calculated from annual increments in dead matter belowground. Total production, underground and aboveground, exceeds that of any marine vegetation, ranging from 3,900 to 6,600 g/sq m/yr in S. alterniflora areas and 3,200 to 6,200 g/sq m/yr in S. patens areas. Fertilization increased production aboveground where deal plant parts are subject to export. (Maroncelli-Mass)
W79-01222

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
F. O. Anderson.
Oikos, Vol. 27, p 243-250, 1976. 10 fig, 7 tab, 26 ref.

Descriptors: *Lakes, *Primary productivity, *Aquatic plants, Wetlands, Swamps, Aerial photography, Phytoplankton, Submerged plants, Eutrophication.

Phytoplankton gross primary productivity in the shallow, eutrophic Danish Lake Arreso was 980 g C per sq m. Calculated net primary production was near zero. Macrophyte net primary production was measured by harvesting the maximum biomass, and above ground values were between 420 and 1325 g ash free dry wt per sq m, while below ground values were between 2480 and 8570 g ash free dry wt per sq m. The reed swamps were mapped on aerial photographs, and the composition of the macrophyte vegetation was determined. A comparison of macrophyte vegetation in 1944 and 1972 showed a reduction in species diversity,

especially of submerged species. The seasonal variations in physical and chemical data indicated strong eutrophication. (Steiner-Mass)
W79-01223

NITROGEN AND PHOSPHORUS FERTILIZATION OF AQUATIC VASCULAR PLANTS AND ALGAE IN REPLICATED PONDS. I. INITIAL RESPONSE TO FERTILIZATION,
Lawler, Matusky and Skelly, Tappan, NY; and Cornell Univ., Ithaca, NY.
H. F. Mulligan, A. Baranowski, and R. Johnson.
Hydrobiologia, Vol. 48, No. 2, p 109-116, February 29, 1976. 8 fig, 3 tab, 14 ref.

Descriptors: *Submerged plants, *Nitrogen, *Phosphorus, *Effects, Nutrient, Rooted aquatic plants, Benthic flora, Standing crops, Phytoplankton, Hydrogen concentration, New York, Ponds, Wetlands.

Populations of common submerged vascular plants were established in a series of 18 experimental ponds in 1967 and subjected to a replicated inorganic N-P fertilization program. The 18 ponds were fertilized as follows in 1968: 6 unfertilized controls, 6 low fertility (.75 mg P/l) and 6 high fertility (75 mg N/l, 7.5 mg P/l). The high fertility levels tended to eliminate the benthic plant populations and increase the phytoplankton standing crops. Elodea canadensis grew in the highest nutrient levels by Myriophyllum spicatum var. exalbescens and Ceratophyllum demersum appeared to be eliminated. Potamogeton crispus produced an abundance of winter buds under conditions of high fertility. There were no obvious differences in the benthic plant and phytoplankton populations among the control and low fertility ponds. (Stihler-Mass)
W79-01224

RESPONSE IN PRODUCTION OF CORD GRASS, SPARTINA ALTERNIFLORA, TO INORGANIC NITROGEN AND PHOSPHORUS FERTILIZER,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W79-01225

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. C. Adriano, A. C. Chang, P. F. Pratt, and R. Sharpless.
Journal of Environmental Quality, Vol. 2, No. 3, p 396-399 July-Sept. 1973. 2 fig, 3 tab, 12 ref. (California Water Resources Center Project UCAL-WRC-W-363).

Descriptors: *Salt injury, Toxicity, Manure decomposition, Plant growth, *Farm wastes, *Waste disposal, *Germination.

Germination and emergence of sudangrass (Sorghum sudanense Stapf 'Piper'), barley (Hordeum vulgare L. 'Numar'), radish (Raphanus sativus L. 'Cherry Belle'), and spinach (Spinacea oleracea L. 'Bloomsdale') in a glasshouse were investigated using a Chino loam soil where various amounts (0, 5, 10, 15, and 20% dry manure by weight) of dairy manure were added. The degree of germination injury depended on the crop species and rate of application or of salt and N inputs. The crop sensitivity to salt or NH3 were as follows: barley < sudangrass and spinach < radish. Barley and sudangrass were more tolerant to salt or NH3 than spinach and radish. Barley germination data from treatments which had NaCl added to the soil extracts to obtain the same osmotic potential as those treated with urine, urea, or manure suggest that the germination injury was not salt specific and that other compounds such as NH3 were also contributing factors. Germination injury can be minimized by planting several days after soil application of large amounts of dairy or feedlot manure to allow volatilization of a significant quantity of NH3 or after adequate preirrigation, or both. (Snyder-Calif, Davis)
W79-01236

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Journal of Environmental Quality, Vol. 5, No. 1, p 57-60, 1976. 5 fig, 1 tab, 19 ref. (California Water Resources Center Project UCAL-WRC-W-420).

Descriptors: Sludge, *Sludge treatment, Environmental effects, Soil chemical properties, *Cadmium, Heavy metals, Toxicity, *Soil contamination effects.

Alfalfa (Medicago sativa L.), white clover (Trifolium repens L.), sudangrass (Sorghum halepense Pers var. Sudanense Hitche.), tall fescue (Festuca elatior L.), and bermudagrass (Cynodon dactylon Pers.) were grown in pot cultures under greenhouse conditions to study the effect of soil Cd levels on Cd uptake and yield. The substrate consisted of a soil (pH 7.5) pretreated with 1% municipal sewage sludge amended with variable amounts of CdSO4. Concentrations of Cd in soil varied from 0.09 (control) to 160 microgram Cd/g soil. Yields of dry matter (70C) were obtained by clipping off the shoots at early bloom stage. Samples of the clippings were analyzed for Cd and Zn. Soil was analyzed after the plant growth experiments were completed. Substrate Cd concentrations of 15, 30, 40, 95, and 145 microgram Cd/g were associated with a 25% yield depression for sudangrass, alfalfa, clover, fescue, and bermudagrass. Corresponding Cd concentrations of clippings were 9, 24, 17, 37, and 43 microgram Cd/g. The soil analysis revealed a close agreement between both DTPA-Cd and saturation extract Cd and Cd uptake and crop yield data. Chemical analysis of saturation extracts showed an inverse effect of Cd on the solubility of Zn. (Snyder-Calif, Davis)
W79-01237

EFFECTS OF KELTHANE AND TEMPERATURE ON THE RESPIRATION OF CRANGON FRANCISCORUM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
J. W. Sharp, R. M. Sitts, and A. W. Knight.
Comparative Biochemistry, Physiology, Vol. 50C, 1978, p 75-79. (California Water Resources Center Project UCAL-WRC-W-243).

Descriptors: *Bioassay, *Shrimp, *Temperature, *Insecticides, California, *Kelthane, *Respiration, Water pollution effects, Chlorniated hydrocarbon pesticides, Estuaries, San Francisco Bay(Calif).

The effects of temperature and the chlorinated hydrocarbon pesticide Kelthane on the respiration of the adult estuarine shrimp Crangon franciscorum, Stimpson were determined. C. franciscorum respiration was determined after 48 hr of acclimation and 96 hr of exposure to six Kelthane concentrations (843, 475, 208, 130, 89 and O microgram/l) at each of three temperatures (16.0 degrees C, 19.0 degrees C and 23.8 degrees C). C franciscorum is a partial metabolic regulator over the temperature range tested. All Kelthane exposure levels depressed oxygen consumption below control rates. (Snyder-Calif Davis)
W79-01241

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5B.
W79-01258

THE IMPORTANCE OF WATER FOR THE SPREAD OF POTENTIALLY PATHOGENIC MYCOBACTERIA: II. GROWTH OF MYCOBACTERIA IN WATER MODELS, (IN GERMAN),
Forschungsinstitut, Borstel (West Germany). Inst. fuer Experimentelle Biologie und Medizin.
J. Kazda.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(2), p 170-176, 1973.

Descriptors: Acidity, Ecology, Growth rates, Lettuce, Model studies, *Mycobacteria, Mycobacterium-avium, Mycobacterium-intracellulare, *Pathogenic bacteria, Temperature, *Water pollution effects.

In water models kept at 30C, growth of Mycobacterium intracellulare serotyoe Davis and M. avium serotype 2 occurred only in 'moorland' water, (pH range 4.2-4.7) (maximum values after 21 days 10 to the 4th power and 10 to the 5th power/ml, respectively). In 2 other 'model' waters (pH values of 7.3-8.3 and 6.9-9.1), no growth of these mycobacteria was observed. The number of water bacteria fell during the experiments in moorland water by 2 orders to 10 to the 3rd power, but in the other types of water they remained constant (10 to the 6th power/ml) or decreased slightly. From 1969-1971 a potentially pathogenic mycobacterium grew only once in a favorable weather period of 18 days (maximum mean daily temperature 29 + or - 2.7C, mean sunshire 10.7 + or - 2.8 h, no ran). After watering lettuce plants with a suspension of serotype Davis (0.1 mg/ml), the mycobacteria lodge, in spite of frequent washing, in the protective crevices of the leaves; entry into the plants themselves was not demonstrated. The close association between the ecology and epidemiology of potentially pathogenic mycobacteria is discussed.--Copyright 1975, Biological Abstracts, Inc.
W79-01259

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 4C.
W79-01260

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Journal of Environmental Quality, No 2, Vol 4, p 207-211, 1975, 3 fig, 3 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-420).

Descriptors: *Sewage sludge, *Sludge disposal, *Cadmium, Plant growth, Plant growth regulators, Chemicals.

Corn, wheat, rice, field bean, soybean, cabbage, spinach, lettuce, curlycress, carrot, turnip, radish, tomato, and squash plants were grown to commercial harvest stage using as the substrate, soil pretreated with a municipal sewage sludge (1%) containing variable amounts of CdSO4 up to 640 micrograms Cd/g soil. Observations included injury symptoms, yield decrement, Cd level of diagnostic tissue, and Cd and Zn content of harvested produce. Cadmium-sensitive plants such as spinach, soybean, curlycress, and lettuce were injured by soil Cd levels of 4-13 microgram Cd/g soil; whereas, tomato and cabbage tolerated soil levels of approximately 170 micrograms Cd/g soil without exhibiting injury symptoms. Rice was tolerant at all levels tested. Leafy plants such as lettuce, spinach, and turnip greens (tops) accumulated 175 to 354 micrograms Cd/g; whereas, fruit and seed tissue of plants under comparable treatment, with the exception of soybean, accumulated no more than 10 to 15 microgram Cd/g tissue. The concentrations for soybean extended up to 30 micrograms Cd/g tissue. Paddy rice exhibited no ill effects for soil Cd treatments up to 640 micrograms CD/g soil. Grain of plants under the 640 micrograms Cd/g treatment contained 2 micrograms Cd/g tissue.

DPTA-extractable Cd correlated (r=0.99) with the level of CdSO4 added to the substrate. (Snyder-Calif, Davis)
W79-01282

THERMAL ALTERATIONS OF AQUATIC ECOSYSTEMS,
Savannah River Ecology Lab. Aiken, SC.
J. W. Gibbons, and R. R. Sharitz.
American Scientist, Vol. 62, No. 6, p 660-670, November-December, 1974. 11 fig, 35 ref.

Descriptors: *Thermal pollution, *Savannah River, Ecological distribution, Effects, Swamps, Species diversity, Pollution, *South Carolina, Temperatures, Invertebrates, Birds, Fish.

Heated effluents released by the U.S. Atomic Energy Commission's Sabannah River Plant in South Carolina may function to enrich or to stress an ecosystem, depending on the biological feature examined. A gradient in temperature was encountered progressing downstream or across a pond or swamp from the source of thermal pollution. Elimination of some species occurred at the extreme high temperature level with no subsequent replacement. Depending on sensitivity, species were reduced or eliminated throughout the temperature gradient. Species diversity and evenness were decreased in some communities, but were maintained or even increased in others where resistant species moved in to fill available niches. Decreased species diversity and increased abundance of one or two dominant species also occurred under thermal stress. Phenomena associated with thermally affected aquatic communities includes accelerated growth rates of individuals and life history alterations. Recovery from heavy thermal loading was found to be slow and perhaps influenced by the proximity of other natural aquatic areas. (Howard-Mass)
W79-01284

SUSPENSION-FEEDING AQUACULTURE SYSTEMS: EFFECTS OF PHYTOPLANKTON CONCENTRATION AND TEMPERATURE ON GROWTH OF THE BAY SCALLOP,
Duke Univ., Beaufort, NC. Marine Lab.
W. W. Kirby-Smith, and R. T. Barber.
Aquaculture. 3(2), p 135-145, 1974.

Descriptors: *Aquaculture, Argopecten irradians, Feeding, *Growth rates, Mathematical models, *Phytoplankton, *Scallops, *Temperature.

The growth rate of the bay scallop Argopecten irradians was studied in relation to temperature and phytoplankton concentration. Normal variations in phytoplankton concentration probably do not influence the growth rate of scallops in their natural habitat. Increasing the concentration of phytoplankton above natural levels did not result in increased growth rates while decreasing the phytoplankton concentration resulted in a decrease in growth rate of the scallops. Under extremely low phytoplankton concentrations, such as those that characterize 'clean water' effluent from a culture syste, the animals ceased growing. A mathematical model of scallop growth rate as a function of phytoplankton concentration is proposed as a tool for comparing the functioning of different suspension feeders in aquaculture systems. Copyright 1975, Biological Abstracts, Inc.
W79-01285

FERTILIZING FISH PONDS: I. CHEMISTRY OF THE WATERS,
Alexandria Inst. Oceanography and Fisheries (Egypt).
S. D. Wahby.
Aquaculture. 3(3), p 245-259, 1974.

Descriptors: Fertilizers, *Fish ponds, *Nitrates, *Phosphates, *Water chemistry, *Fertilization.

Fertilization experiments were carried out in the Mex fish farm using superphosphate, ammonium nitrate and organic manure as fertilizers (to increase fish production). The water was analysed monthly for inorganic phosphates, nitrates and silicates, in addition to chlorosity and pH. The ponds fertilized with chemical fertilizers exhibited a more rapid consumption of nutrients than the pond fertilized with organic manure. Phosphates and nitrates disappeared from the ponds after about 2 days of addition.--Copyright 1975, Biological Abstracts, Inc.
W79-01286

EFFECT OF BEEF-FEEDLOT-LAGOON WATER ON SOIL CHEMICAL PROPERTIES AND GROWTH AND COMPOSITION OF CORN FORAGE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
G. W. Wallingford, L. S. Murphy, W. L. Powers, and H. L. Manges.
J Environ Qual. 3(1), p 74-78, 1974.

Descriptors: Corn(Field), Crop production, *Feedlots, Fertility, Forage, Growth rates, Lagoons, Minerals, Nutrients, Salinity, Soils, *Farm wastes, Waste disposal, Water pollution effects.

Land disposal of beef-feedlot-lagoon (runoff) water was studied. Rates of 0, 8, 15, 26 and 46 cm/yr of lagoon water were applied during the summers of 1970 and 1971 by furrow irrigation to a silty clay loam soil. Corn (Zea mays L.) forage yield and plant content of N, P, K, Ca, Mg, and Na were measured. Surface soil samples and soil cores were taken from the plots after harvest each year. Electrical conductivity ranged 1.6-7.6 (3.1 average) mmho/cm in the lagoon water applied at the study site and from 1.0 to 12.8 mmho/cm in samples taken from 12 Kansas (USA) feedlots. Electrical conductivities of extracts from saturated pastes of the surface soil samples were increased linearly by accumulative treatment both years. The 1970 and 1971 soil cores showed accumulations of NO3-N, P, K, and Na in the top 30 cm at all treatment rates. Movement of NO3-N and Na down to 100 cm was noted in the 1971 cores from plots receiving 46 cm/yr. Ca and Mg in the soil cores were not affected by treatment either year. Corn forage yields were a linear function of treatment in 1970 and a quadratic function in 1971. The positive effect on yield both years was attributed to increased soil fertility; the relative decrease in 1971 at 26 and 46 cm/yr rates was attributed to increased soil salinity. Maximum yield and uptake of N and P were reached at the 15 cm/yr disposal rate in 1971. Copyright 1974, Biological Abstracts, Inc.
W79-01290

THE RESPONSE OF EMPETRUM NIGRUM L. TO DIFFERENT MIRE WATER REGIMES, WITH SPECIAL REFERENCE TO WYBUNBURY MOSS, CHESHIRE AND FEATHERBED MOSS, DERBYSHIRE,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
J. N. B. Bell, and J. H. Tallis.
J Ecol. 62(1), p 73-95, 1974.

Descriptors: Adaptation, *Carbon dioxide, Cheshire, Climates, Derbyshire, *Empetrum nigrum, England, *Hydrogen sulfide, Mire, *Moss, *Oxygen depletion, Peat, Physiological studies, Rainfall, Roots, Water table, Wybunbury.

The decline and subsequent revival of the E. nigrum colony at Wybunbury Moss, Cheshire (England) between 1965 and 1968, were investigated and were shown to have coincided with a rise and fall respectively in the mean summer water table, resulting from rainfall variation and the condition of the main drainage channel from the mire. Field observations at Wybunbury Moss, Featherbed Moss and laboratory experiments showed that E. nigrum is adversely affected by prolonged waterlogging. In general, E. nigrum occurs on the drier parts of mire sites, although evidence presented suggests that there may be physiological adaptation in some places to different water regimes. At Wybunbury Moss the plants are adapted to relatively dry conditions and are thus particularly sensitive to a high water table. At Featherbed Moss E. nigrum is absent from regions with the highest CO2 partial pressures in the peat. At Wybunbury Moss high H2S and/or CO2 levels as well as an O2 deficiency in the substratum, resulting from the high water table, are considered to have damaged the roots. There is evidence that elevated Al concentrations in the mire water, accompanying the rise in water table, may have contributed to the decline of E. nigrum. Copyright 1974, Biological Abstracts, Inc.
W79-01293

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
J. L. Gallagher, and F. C. Daiber.
Limnology and Oceanography, Vol 19, No 3, p 390-395, May, 1974. 4 fig, 2 tab, 10 ref.

Descriptors: *Salt marshes, *Soil algae, *Primary productivity, Wetlands, Marshes, Algae, Productivity, Delaware, Marsh plants.

Gross primary production of edaphic algae was estimated for five areas in a high salinity tidal marsh near Lewes, Delaware. Salt pan and bare bank (free of angiosperms) algal production did not vary significantly from one part of the year to another. Algal productivity in the tall Spartina alterniflora and Distichlis spicata areas was greatest from mid-January to mid-May. In the short S. alterniflora area, algal productivity did not decrease in the warmest part of the year as it did in the two other grass areas. Annual cycles of light, temperature, and salinity were measured. Gross algal production was about a third of the angiosperm net production. Since much of the algal production occurs when angiosperms are dormant, it complements the pattern of angiosperm energy fixation. (Steiner-Mass)
W79-01296

TRENDS IN THE ABUNDANCE OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER BASIN,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Chesapeake Sci. 15(2), p 96-103, 1974.

Descriptors: Alosa-sapidissima, *American shad, Bays, *Delaware River Basin, River, Water pollution effects.

The American shad, A. sapidissima was abundant in the Delaware River Basin until 1901. Annual commercial landings from 1890-1901 (about 11-17 million lb) were several times grater than in any other river system. Abundance declined rapedly after 1901, except for a resurgence in 1907, which may be interpreted as evidence that by 1903 polution was affecting successful seaward movement of young produced in the Delaware Rivr. Less than 0.5 million lb were landed in 1920. Abundance had remained low since 1920, although fluctuations have occurred. Extra-Delaware basin fish mix with Delaware Basin fish at the more of Delaware Bay. It is not clear how far extra-Delaware Basin fish penetrate upbay, but they do not enter freshwater of the Delaware River. Records available for several years in the period 1890-1901 indicate that 39% of the total Delaware Basin landings came from freshwater of the Delaware River, suggesting that landings at that time were primarily dependent on Delaware Basin fish.--Copyrigh 1974, Biological Abstratcs, Inc.
W79-01322

PHOSPHORUS CYCLING IN NUPHAR LUTEUM COMMUNITIES IN THE LOWER CHOWAN RIVER, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Biology.
R. R. Twilley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 915, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, July 1976, 120 p 20 fig, 14 tab, 86 ref.

OWRT B-079-NC(5).

Descriptors: *Rooted aquatic plants, *Aquatic plants, *Aquatic weeds, *Plant growth, Aquatic productivity, Cycling nutrients, Chemical analysis, Nutrient removal, *Chowan River(NC), *North Carolina, *Aquatic macrophyte, *Yellow water lily.

This study evaluated the role of Nuphar luteum in the cycling of phosphorus (P) in the lower Chowan River. Measurements were made of (a) seasonal and spatial P concentrations in the plant, (b) fractions available to the plant in the substrate and (c) P flux between plant sediment, and overlying water. The P concentration in the aboveground biomass (leaves and petioles) peaked during early spring (241.57 g-jat P/g OW) while the rhizomes declined in P concentrations during this season. Rhizomes accumulated the greatest amount (66.2%) ofthe P bound in the biomas of Nuphar followed by roots (10.6%) with the remainder (7.1-8.1%) in the three aboveground structures. Total acumulation of P in the biomass of Nuphar during June in the lower Chowan River was 0.243 MT. At three sites, the biological available phosphorus concentration and the P concentration in the roots correlated better (r=0.90) than did interstitial water and root concentration (r=o74). Uptake translocation, and subsequent secretion of phosphours by Nuphar was studied under laboratory and field conditions using radioiostopes. In both laboratory and field experiments, translocation of P absorbed by roots occurred more rapidly and extensively than with submersed leaves and floating leaves. A bidirectional flux of P was measured in Nuphar and the dominant pathway was from below ground to aboveground structures. The flux of P between the aboveground and belowground structures varied between spring, winter, and summer and the translocation rates were affected more by the seasons than the absorption rates. (Kiger - North Carolina)
W79-01326

THE EFFECT OF SEVERAL PHYSICAL AND CHEMICAL FACTORS UPON THE DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN DUNHAM POND, CONNECTICUT,

Connecticut Univ., Storrs.
B. L. Pallotti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 924, Price codes: A04 in paper copy, A01 in microfiche. 1976 62 p, 12 fig, 10 tab, 43 ref, 2 append. OWRT A-054-CONN(6), OWRT 14-31-0001-4007.

Descriptors: *Benthic fauna, *Invertebrates, *Distribution patterns, *Lakes, *Wetlands, Carbon dioxide, Oxygen, Optical properties, Littoral, Profundal zone, *Connecticut, *Macroinvertebrates, *Physical properties, Chemical properties, *Softwater lake, *Sphagnum-red maple bog, *Sediment particle size, *Sediment organic weight, Ponar dredge, Dunham Pond(Conn).

The distribution of benthic macroinvertebrates in Dunham Pond, a small (4.7 ha) soft water lake in Mansfield, Connecticut, was determined. Although shallow, Dunham Pond stratifies and maintains an anaerobic hypolimnion throughout the summer. Inflow is received from two streams entering from a Sphagnum-red maple bog to the north and woodland to the east. Monthly sampling at nine stations, covering the most diverse types of lake habitat, began in June 1975 and continued for one year. Replicate ponar dredge samples were taken from which species identifications were made. Carbon dioxide, oxygen, and conductivity, optical density, sediment particle size and sediment organic weight were determined. A total of 27 species of organisms was found, although only 10 species were present in continually significant numbers. All of the littoral organisms present were found in the greatest numbers at the site of the single outlet stream or woodland inlet and generally decreased towards the bog inlet. The profundal organisms followed the same general pattern of lessening numbers towards the bog inlet. This pattern of organism distribuion follows a trend seen in the physical and chemical parameters. This trend shows the wetland's influence to be greatest at the northern end of the lake and then diminish away from the bog inlet.
W79-01330

CHARACTERISTICS OF SMALL MAMMAL POPULATIONS IN FORESTED AND OLD FIELD HABITATS PRIOR TO EFFLUENT SPRAY IRRIGATION,

Pennsylvania State Univ., University Park.
J. D. Spring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 948, Price codes: A04 in paper copy, A01 in microfiche. Master of Science thesis, November 1977. 60 p, 9 fig, 15 tab, 49 ref, 1 append. OWRT B-084-PA(1), 14-34-0001-6113.

Descriptors: *Waste water(Irrigation), *Sewage effluents, *Mammals, *Wildlife habitats, *Animal populations, Forests, Pennsylvania, *Renovation, *White-footed mice, *Meadow vole, Cropland, Vegetation analysis, Prespray site, Control site, Dense undergrowth.

This study was designed to (1) investigate the population characteristics of two small mammal species, the white-footed mouse and the meadow vole, (2) study the diversity of the small mammal communities in forests and old fields, and (3) analyze the plant composition of the old fields. Censusing of the small mammal populations was carried out during spring and fall 1976 and spring 1977 on prespray and control sites. Vegetational analysis was conducted during summer 1976. The mice on both the prespray and control sites increased significantly from spring 1976 to fall 1976 and then decreased from fall 1976 to spring 1977. The amplitude of fluctuation on the control site was far greater than on the prespray area. The larger amount of dense undergrowth on the control site probably made this area more suitable. Both meadow vole populations displayed a significant increase in population density from spring 1976 to fall 1976 with a subsequent decline by spring 1977. These populations showed tendencies for a population cycle with a periodicity of about two years. The control site was more suitable for them than the prespray area due to a high proportion of grasses in the plant community and greater coverage. (Sink-Penn State)
W79-01331

FATTY ACID COMPOSITION OF ORGANIC DETRITUS FROM SPARTINA ALTERNIFLORA,

Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. M. Schultz, and J. G. Quinn.
Estuarine Coastal Mar Sci. 1(2), p 177-190, 1973.

Descriptors: Decomposition, *Detritus, *Fatty-acid, Microbial degradation, Molecular structure, Organic matter, *Spartina-alterniflora, Tides, *Rhode Island, *Narragansett Bay(RI).

The fatty acid composition and concentration of the marsh grass S. alterniflora were determined monthly (Jan. to Dec., 1971) on samples of stems and leaves collected from Bissel Cove, Narragansett Bay, Rhode Island. Seasonal differences were found in both composition and concentration. The fatty acids present in suspended organic matter collected at the mouth of Bissel Cove during ebb and flood tide for the same period were also analyzed. Laboratory model studies involving the formation of suspended organic matter by the decomposition of S. alterniflora were investigated under aerobic and anaerobic conditions, using both organic solvent-extracted and non-extracted grass. Field model studies were also conducted on marsh grass decomposing in Bissel Cove, using both extracted and non-extracted grass. The fatty acid composition and concentration of suspended organic matter formed in the various model studies were similar to those found in the natural material and differed markedly from that of S. alterniflora. The total fatty acid concentration and the branched chain 15-C acids of both natural and model suspended matter gave higher values than those found in S. alterniflora. These branched chain acids appear to be the result of microbial activity and their high levels in the suspended organic matter, together with the fatty acid concentrations of the model studies using extracted marsh grass, indicate that micro-organisms are very important in the formation of the natural organic detritus.--Copyright 1974, Biological Abstracts, Inc.
W79-01332

ULTRASTRUCTURE OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS INFECTED WITH AS-1 VIRUS,

California Univ., Riverside. Dept. of Plant Pathology.
M. B. Barkley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 919, Price codes: A08 in paper copy, A01 in microfiche. PhD Dissertation, December 1976. 144 p, 20 fig, 6 tab, 138 ref, 6 append. (Water Resources Center Project UCAL-WRC-W-496). OWRT B-176-CAL(1).

Descriptors: *Cyanophyta, *Viruses, *Adsorption, Plant pathology, Cultivation, *Anacystis nidulans, *Plant viruses, Electron microscopy, Algae, *Ultrastructure(Virus infection).

Precise environmental conditions for culturing Anacystis nidulans IU 625 had to be defined before ultrastructural aspects of virus infection could be initiated. Host cells in a known physiological state could thus be harvested for determining the rate of virus adsorption and growth. Previously described methods for purifying cyanophages from lysates of inoculated host cultures were unsatisfactory. A new method was developed involving treatment of lysate with bentonite, concentration by evaporation, and density gradient centrifugation. Purified virus was free of cellular debris, homogeneous with respect to particle morphology, and highly infectious. Treatment of lysates with bentonite stabilized infectivity of the virus. Purified virus may be stored for prolonged periods of time at room temperature, but the medium in which it is stored is critical. Under conditions used for cultivation of the host and virus, adsorption of the virus to host cells was not a first order reaction. Attempts to improve the rate of adsorption were unsuccessful. Electron microscopic studies of the infection process indicated the peripheral photosynthetic membranes of the host are infrequently observed to curve inwards beginning at one hour post inoculation(HPI). The invagination response of the thylakoids occurs with greater frequency by two HPI and progressively increases throughout the infection cycle. (Snyder-Calif Davis)
W79-01334

DISSOLVED ORGANIC CARBON FLUXES IN THE SHETUCKET RIVER OF EASTERN CONNECTICUT, USA,

Conneticut Univ., Storrs. Inst. of Water Resources.
R. L. Klotz, and E. A. Matson.
Freshwater Biology, Vol. 8, p 347-355, 1978. 4 fig, 3 tab, 35 ref. OWRT A-052-CONN(19), 14-31-0001-3507.

Descriptors: *Lotic environment, *Connecticut, *Organic carbon, Dissolved solids, *Dissolved organic carbon fluxes, *Sewage treatment plant, Net uptake, Benthic heterotrophs, *Shetucket River(Conn).

Seasonal changes in dissolved organic carbon (DOC) concentrations were monitored biweekly for one year at seven stations in the Shetucket River watershed in eastern Connecticut, U.S.A. Nine monthly diurnal studies revealed 24 hour fluctuations of up to 53% of the seasonal range of 250 to 2200 micromoles DOC. Net DOC removal along a 1.9 km stretch below a secondary sewage treatment plant (activated sludge effluent diluted to a final average volume of 1.4% in the river) ranged from 0 to 1600 and averaged 68 + or - 64 mmol/sq m/day. Removal of DOC farther downstream could only be observed during a severe three-hour October storm when net uptake ranged from 16 to

92 mmol/sq m/hr, using upstream-downstream techniques. Oxygen respiration could account for about half of the net DOC removal during the October storm. Even though net uptake was somewhate greater than reported in other lotic studies, about 97% of the DOC potentially available to benthic heterotrophs was exported further downstream.
W79-01337

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE NORTH ARM,
Utah State Univ., Logan. Dept. of Biology.
F. J. Post.
In: Desertic Terminal Lakes: Proceedings of the International Conference on Desertic Terminal Lakes, Weber State College, Ogden, Utah Deon C. Greer, Ed., Utah Water Research Laboratory. Publication Logan 1977. OWRT A-024-UTAH(3). 14-34-0001-6046.

Descriptors: Halobacteria, Halophilic bacteria, Brine fly, Brine shrimp, Terminal lake, Halophage, Microbiology, Organic matter, Bacteria, Algae, Nitrogen, *Utah, Saline lakes, Lakes, *Great Salt Lake, Utah, Dunaliella salina, Dunaliella viridis, Halobacterium.

The north arm of the Great Salt Lake is high in salts and high in organic matter as reflected in the large soluble organic nitrogen pool, with a very large number of halophilic bacteria, 70,000,000 or more per ml. Accompanying the bacteria and apparently dependent on them for ammonium ion are several algae, Dunaliella salina and D. viridis. The brine shrimp and brine fly larvae feed on the algae and possibly the bacteria as well. No nitrate or nitrite has been demonstrated in the lake or laboratory microcosms nor has any nitrogen fixation been demonstrated in any lake samples so far. A model of nitrogen and organismal interaction is described.
W79-01346

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE,
Utah State Univ., Logan. Dept. of Biology.
J. Post.
Microbial Ecology Vol 3, p 143-165, 1977.

Descriptors: Terminal lakes, Halophilic bacteria, Protozoa, Dead Sea, Cycling nutrients, Bacteria, Algae, Saline lakes, Lakes, Biomass, *Great Salt Lake, *Utah, Dead Sea, Cycling nutrient, Artemia salina, Ephydra.

The Great Salt Lake is actually two lakes. A highly saline northern arm and a moderately saline southern arm separated by a semipermeable rock causeway. The lake, particularly the northern arm, has a massive accumulation of organic matter resulting from more than 100,000 years of productivity, cycling from a freshwater to a saline lake, plus the influence of human industry and agriculture in more recent times. The north arm planktonic and attached community consists principally of, in order of biomass: bacteria of at least two general, Halobacterium and Halococcus; two algae, Dunaliella salina na D. viridis; the brine shrimp, Artemia salina; and, two species of brine fly, Ephydra gracilis and E. hian and possibly one more species. The algae and the bacteria appear to depend on each other for nutrients. The bacteria use orgnic matter produced by the algae and the algae use ammonia produced by the bacteria and possibly the brine shrimp. The production of ammonia appears to be the rate-limiting step although there is no shortage of other forms of nitrogen in the north arm. Based on aquarium studies, the potential for biomass production of algae and bacteria is much higher than actually observed in the north arm, leading to the postulation of two additional factors controlling population; the grazing of the algae by invertebrates with the excretion of compounds rich in nitrogen, and the effect of a low habitat temperature and winter cold on the bacteria, reducing their metabolic activities to nearly zero.
W79-01347

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
R. E. Terry.
Available from the National Technical Service, Springfield, VA 22161 as PB-288 945, Price codes: A09 in paper copy, A01 in microfiche. PhD Dissertation 1976, 163 p, 28 fig, 35 tab, 79 ref. OWRT B-066-IND(3).

Descriptors: *Sewage sludge, *Nitrification, *Soil amendments, Carbon, Nitrogen, Ammonia, Soil management, Soil properties, Organic matter soil moisture, Anaerobic conditions, Sludge treatment, *Nitrogen transformation, Soil characteristics, Land application, Mineralization, Clay content.

The objective was to determine the effects of soil characteristics, sludge managent procedures, and environmental conditions on the decomposition rate of sludge in soils and on nitrogen transformations in sludge amended soils. Synthetic sewage sludges were prepared by anerobically digesting mixtures of 14C- and 15N-labeled Candida utilis cells and inorganic salts. The prepared sludges were similar in composition to anaerobically-digested municipal sludges. A fraction of anaerobically-digested sludges decomposed rapidly when added to an aerobic soil; however, 55 to 80% was resistant to decomposition. Decomposition of sludge in soil increased the breakdown of native soil organic matter while nitrification rates were also faster in sludge-amended soils as compared to nonamended soils. Ammonia volatilization from sludge-amended soils was greatest under conditions of rapid drying of the soil-sludge mixture, high soil pH (7.5), and low clay content of soils. No loss of applied N was observed in samples where sludge was incorporated and where the sample did not lose moisture during incubation. (Wiersma-Purdue)
W79-01350

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-01356

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
C. D. Zamuda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 943, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, December 1976. 77 p, 14 fig, 10 tab, 63 ref. OWRT A-077-NC(10), 14-31-0001-5033.

Descriptors: *Aquatic plants, *Recycling, *Temperature, *Salinity, *Biomass, Estuaries, *Seasonal growth(Plants), Organic matter, Productivity, Growth rates, Growth stages, *Pamlico River Estuary(NC), *North Carolina, Plant decay, Plant density.

Seasonal rates of growth and production and of inorganic and organic matter losses were determined for Vallisneria americana Michx. in the Pamlico River estuary of North Carolina. A direct marking technique was utilized to measure in situ changes in biomass and leaf dynamics for plants from two dissimilar locations. The upriver study site was characterized by extensive plant beds and low salinities (0-5 0/00) while at the downriver site, plants were less dense and exposed to higher salinities (2-11 0/00). The mean rate of leaf elongation was 5.6 mm/day for both locations. Plants produced a new leaf on the seasonal average of every 9.9 days, with greater rates for the downriver plants (8.2 days) as compared to those upriver (11.6 days). The seasonal mean production value was 2.3 mg ODW (organic dry weight)/plant day, with values generally greater downriver. Plants were harvested seasonally and maintained submerged in nylon bags (mesh=1mm), with a littoral and midriver decay site at each station. Summer decay was rapid with as much as 70% of the organic matter lost within the first two weeks. Decay coefficients for spring and summer material (k= 19.5) were greater than winter material (k= 10.0). Newly harvested plants had maximum levels of inorganic nutrients in winter: N, 4.3% ODW; P, 0.6%; Ca, 0.5%; Mg, 0.4%; K, 3.7%; and Na, 2.3%. During decay N and P concentrations remained essentially constant or gradually increased on the basis of ODW remaining. Sodium and K levels fluctuated, with concentrations increasing in spring and decreasing throughout the other seasons. Calcium levels initially increased and then decreased while Mg concentrations remained constant except for a summer decline. (Kiger-North Carolina)
W79-01362

A SURVEY OF THE FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) OF THE KANAWHA RIVER OF WEST VIRGINIA,
Marshall Univ., Huntington, WV. Dept. of Biological Sciences.
J. S. Morris, and R. W. Taylor.
The Nautilus, Vol. 92, No. 4, p 153-155, 1978. 1 fig, 4 ref.

Descriptors: *Mussels, *Clams, *Industrial wastes, Municipal wastes, Habitats, Water quality, Channel improvements, Acid streams, Coal mine wastes, Chemical wastes, Water analysis, Animal populations, *West Virginia, *Unionid clams, *Upper Kanawha River(W VA).

During the summer of 1976 a survey of the upper Kanawha River produced thirteen species of unionid clams. Although suitable habitat was found throughout the drainage, clams were found in only the upper reaches of the river. Possible explanations for the absence of clams downstream are industial and urban pollution and habitat modification for navigational purposes. (EIS-Deal)
W79-01435

ACUTE TOXICITY AT THREE PRIMARY SEWAGE TREATMENT PLANTS,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
D. W. Martens, and J. A. Servizi.
International Pacific Salmon Fisheries Commission, Progress Report No 33, 20 p, 1976. 8 tab, 22 ref.

Descriptors: *Toxicity, *Bioassay, *Sockeye salmon, Statistical methods, Sewage treatment, Sewage effluents, Ammonia, Surfactants, Water pollution sources, Water pollution effects, Fry, Mortality, Iron, Copper, Alkalinity, Bioassays, Canada, Primary sewage effluent, Vancouver(British Columbia).

Continuous flow bioassays were conducted at three primary sewage treatment plants in the Greater Vancouver area using fingerling sockeye salmon (Oncorhynchus nerka). Geometric mean survival time (GMST) in undiluted primary effluent and survival during 96 h exposure to a range of dilutions was measured. Multiple regression analysis was used to obtain a relationship between GMST and constituents of primary sewage at one treatment plant. Anionic surfactants and un-ionized ammonia were positively correlated with acute toxicity but iron and alkalinity were negatively correlated. However, these substances did not account for all the acute toxicity measured. Although copper was present at significant concentration, it was not correlated with acute toxicity. (EIS-Deal)
W79-01436

EFFECTS OF INDUSTRIAL WASTEWATER EFFLUENTS ON WATER QUALITY IN GIBSON COVE AND KODIAK HARBOR, KODIAK, ALASKA, AUGUST 26-29, 1974.
Environmental Protection Agency, Anchorage, AK. Alaska Operations Office.
Working Paper No. EPA-910-8-76-095, 62 p, June 1975. 8 tab, 6 ref, append.

Descriptors: *Water quality standards, *Water analysis, *Alaska, *Food processing industry, *Shrimp, Commercial shellfish, Water quality control, Water quality, Water chemistry, Chemical analysis, Commercial fishing, Water temperature, Hydrogen ion concentration, Bottom sediments, Effluents, Waste water disposal, Waste disposal, Solid wastes, Water pollution sources, Water pollution effects, Kodiak, Alaska.

A brief water quality survey was conducted at Gibson Cove and Kodiak Harbor, Kodiak, Alaska to determine the water quality influences of waste discharges from 15 seafood processing plants following installation and operation of screening equipment for solid removal from processing wastewater effluents, and to assay any improvements in the waste receiving waters as a consequence of installation of these screens. Data obtained from three water column stations and one bottom station in Gibson Cove, and 10 water column stations plus 11 bottom stations in Kodiak Harbor consisted primarily of measurements for dissolved oxygen, temperature, pH, conductivity, and transparency, and selected chemical and visual analyses of bottom deposits. The degree of water quality impairment was discussed and recommendations for improvement were provided. (EIS-Deal)
W79-01437

INFLUENCE OF TEMPERATURE ON GROWTH PROMOTION AND BODY COMPOSITION OF CARP (CYPRINUS CARPIO) DUE TO BOVINE GROWTH HORMONE,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
I. R. Adelman.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 747-750, 1978. 3 tab, 10 ref.

Descriptors: *Carp, *Growth rates, *Fish physiology, *Water temperature, Proteins, Biochemistry, Animal metabolism, Weight, Size, Fish behavior, Fish management, Freshwater fish, Lipids, Aquiculture, *Hormones, *Growth hormones, *Tissue analysis.

Yearling carp held at four constant temperatures were injectd with bovine growth hormone. A relatively greater responsiveness to growth hormone injections was found at below-optimum temperatures of 9.2 and 19.5C and the above-optimum temperature of 35.8C than at the optimum temperature for growth, 29.6C. There was no significant effect of the hormone on body composition. (EIS-Deal)
W79-01438

NITROGEN FERTILIZATION OF PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd, and J. W. Sowles.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 737-741, 1978. 5 tab, 17 ref.

Descriptors: *Sunfishes, *Bass, *Fertilization, Fertilizers, Nutrient requirements, Nitrogen, Phosphorus, Nutrients, Sport fish, Ponds, Fish management, Fish stocking, Nitrate, Plankton, Growth rates, Phytoplankton, Productivity, Bluegill, Largemouth bass, Aquiculture.

Nitrogen fertilization failed to increase the production of bluegill (Lepomis macrochirus) and plankton in small experimental ponds which were also fertilized with phosphorus. In an experiment conducted in larger ponds, nitrogen plus phosphorus fertilization was no more effective than phosphorus-only fertilization in promoting plankton growth. However, an earlier experiment demonstrated that the addition of nitrogen and phosphorus fertilizers to ponds increased bluegill production, but not largemouth bass (Micropterus salmoides) production, above that achieved with phosphorus-only fertilization. Nevertheless, phosphorus-only fertilization will appreciably increase production of sport fish in ponds, and because of the added cost, nitrogen fertilizers should not be used in fertilization programs for most sportfish ponds. (EIS-Deal)
W79-01439

EFFECT OF LONG-TERM REDUCTION AND DIEL FLUCTUATION IN DISSOLVED OXYGEN ON SPAWNING OF BLACK CRAPPIE, POMOXIS NIGROMACULATUS,
Environmental Research Lab.-Duluth, MN.
A. R. Carlson, and L. J. Herman.
Transactions of the American Fisheries Society, Vol. 107, No 5, p 742-746, 1878. 1 fig, 1 tab, 9 ref.

Descriptors: *Dissolved oxygen, *Sunfishes, *Seasonal, *Spawning, Fish behavior, Toxicity, Fish reproduction, Mortality, Growth rates, Water temperature, Embryonic growth stage, Fish physiology, Animal metabolism, Fertility, Methodology, *Survival, *Tissue analysis, Black crappie.

Mature black crappies were exposed over winter in the laboratory to constant dissolved oxygen concentrations near 2.5, 4.0, 5.5, and 7.0 mg/liter. Starting on 26 April during a simulated spring-to-summer rise in water temperature, some were continued at the original oxygen concentrations while others were subjected to mean diel fluctuations ranging from 0.8 to 1.9 mg O2/liter above and below the original concentrations. Controls were maintained at concentrations near air saturation. No spawning occurred at the lowest fluctuating treatment of 1.8 to 4.1 mg/liter. This treatment also caused behavioral aberrations as the water temperature reached 20C. Successful spawning occurred during all other treatment. (EIS-Deal)
W79-01440

THE BEHAVIOR OF JUVENILE ATLANTIC SALMON (SALMO SALAR) AND BROOK TROUT (SALVELINUS FONTINALIS) WITH REGARD TO TEMPERATURE AND TO WATER VELOCITY,
Woods Hole Oceanographic Institution, MA.
R. J. Gibson.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 703-712, 1978. 3 fig, 6 tab, 23 ref.

Descriptors: *Fish behavior, *Brook trout, *Atlantic salmon, *Water temperature, Juvenile growth stage, Seasonal, Habitats, Spawning, Fish reproduction, Fish physiology, Velocity, Flow, Turbulent flow, Cold-water fish, Animal metabolism, *Substrates, *Parr, Matamek Research Station, Quebec.

Atlantic salmon parr and brook trout were observed in stream tanks at the Matamek Research Station, Quebec. In the autumn, at 10C Atlantic salmon parr began sheltering in rubble and at 9C the majority had disappeared into hiding. Brook trout also had this tendency to hide at cold temperatures, but not as strongly as the salmon. In slow water flows, Atlantic salmon parr tended to hide in the rubble substrate at any temperatures, and aggression decreased. In both slow and faster water velocities during summer and autumn the commonest agonistic act by Atlantic salmon parr was 'charge and chase'. Brook trout in July showed 'nip' as the commonest agonistic act, but in September and October 'approach' and 'charge and chase' were more common, possibly due to aggression associated with spawning. Shade was attractive to both species in shallow water, but given the choice of a shallow (30 cm) tank with a shade cover, and deeper (50 cm) tank with no shade, the majority of brook trout and Atlantic salmon selected the deeper tank. In one experiment in a shallow-water tank, turbulent water surface was more attractive to Atlantic salmon parr than shade. (EIS-Deal)
W79-01441

METHODS OF CONTAMINATION OF TWO FRESHWATER FOOD CHAINS BY COBALT 60: I. DIRECT CONTAMINATION OF THE ORGANISMS BY THE WATER (MODALITES DE LA CONTAMINATION DE DEUX CHAINES TROPHIQUES DULCAQUICOLES PAR LE COBALT 60: I. CONTAMINATION DIRECTE DES ORGANISMES PAR L'EAU),
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance (France). Lab. D'Etude de la Pollution des Eaux.
A. Amiard-Triquet, and L. Foulquier.
Water, Air, and Soil Pollution, Vol. 9, p 475-489, 1978. 2 fig, 4 tab, 40 ref.

Descriptors: *Food chains, *Cobalt, Path of pollutants, Tracers, Radioactivity techniques, Chlorella, Daphnia, Crustaceans, Mollusks, Carp, Crayfish, Chemical properties, Trophic level, Ecosystems, Metals, *Elodea, *Bioaccumulation.

The behavior of Cobalt 60 in two freshwater food chains was examined. Concentration factors obtained in laboratory conditions are of limited value for extrapolation to environmental conditions; however, such experimental data do have a relative value. Generally the most highly contaminated species were the primary elements in the food chain, particularly macrophytes. Radioactivity levels in animal species decreased directly with increasing zoological complexity, which in turn generally corresponded to a higher trophic level. This factor must be considered during subsequent research on Cobalt 60 transfer in ecosystems through the food vector. (EIS-Deal)
W79-01442

METABOLISM OF POLYCHLORINATED BIPHENYLS BY MARINE BACTERIA,
Woods Hole Oceanographic Institution, MA.
A. E. Carey, and G. R. Harvey.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 527-534, 1978. 3 fig, 25 ref.

Descriptors: *Polychlorinated biphenyls, *Metabolism, *Microbial degradation, Biodegradation, Marine bacteria, Chemical analysis, Chemical properties, Bottom sediments, Organic compounds, Radioactivity techniques, Aroclors, Path of pollutants, Marshes, *Radiochromatography.

Mixed cultures of nearshore marine bacteria are capable of metabolizing PCBs. We have isolated and partially characterized an acid lactone metabolite whose structure is unlike any thus far reported in PCB metabolism studies. We found no metabolism in an anaerobic marine mud incubated with a chloribiphenyl isomer for 6 weeks. These results imply that in the large areas of anoxic sediments found in marshes, estuaries and basins like the Black Sea, PCBs will remain unaltered biologically or chemically. These anaerobic environments may then serve as long term sinks for PCBs. (EIS-Deal)
W79-01443

LAG ADJUSTMENT BETWEEN ESTIMATED AND ACTUAL PHYSIOLOGICAL RESPONSES CONDUCTED IN FLOW-THROUGH SYSTEMS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. J. Niimi.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1265-1269, 1978. 2 fig, 10 ref.

Descriptors: *Bioassay, *Analytical techniques, *Mathematical studies, Laboratory tests, Testing procedures, Absorption, Respiration, Toxicity, Fish physiology, Animal physiology, Animal metabolism, Mathematical models, Methodology, *Depuration.

The results from physiological experiments that use a flow-through or open system may be biased because of the lag. The nature of this discrepancy is attributable to a delay between the actual response of an organism and the measured response of the system. An equation is presented that would adjust the measurement for lag. This procedure is especially important when measuring time-dependent uptake and depuration rates like those reported in respiratory and toxicological studies. (EIS-Deal)
W79-01445

EFFECTS OF CHELATED IRON ON THE GROWTH OF TWO SPECIES OF VALLISNERIA,
University of South Florida, Tampa. Dept. of Biology.
P. M. Dooris, and D. F. Martin.
Water Resources Bulletin, Vol. 14, No. 5, p 1088-1093. 1978. 4 tab, 12 ref.

Descriptors: *Iron, *Chelation, *Plant growth, *Aquatic weeds, Dissolved oxygen, Metals, Plant physiology, Plant growth regulators, Aquatic weed control, Organic compounds, Nutrient requirements, Growth rates, Eutrophication, Lakes, Lake stages, *Vallisneria, *EDTA.

Iron, added as (Fe-EDTA)-, was found stimulatory to V. spiralis at a concentration of 0.05 ppm. It had no effect upon growth of V. neotropicalis as measured by changes in dissolved oxygen and dry weight. Results are compared with those derived from similar studies with Hydrilla verticillata and Egeria densa. The implications of lake drawdown and aeration are discussed. (EIS-Deal)
W79-01446

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
R. B. Juul, and J. V. Shireman.
Water Research, Vol. 12, p 691-701, 1978. 6 fig, 3 tab, 19 ref.

Descriptors: *Pulp wastes, *Diptera, *Sunfishes, *Catfishes, *Food habits, Chemical wastes, Industrial wastes, Fish populations, Benthic fauna, Bullheads, Seasonal, Effluents, Biological treatment, Water chemistry, Water quality, Growth rates, Fish reproduction, Industrial effluents, Water pollution effects, *Mosquitofish.

Various aspects of the benthos and fish populations living within a kraft pulp mill effluent channel were monitored from June, 1974 to September, 1975. Chironomid larvae dominated the benthos, and were distributed within the channel in relation to bottom type and current characteristics. Yearly abundance of chironomid larvae was correlated with measured flow through the channel. A total of 25 species of fish were taken from the channel. Many of these were collected seasonally and did not appear to be permanent residents of the channel. Food habits for warmouth revealed chironomid larvae and mosquitofish to be major food items. White catfish and brown bullhead had similar feeding habits. All fish examined for food habits utilized other aquatic insects to a greater extent in the summer, as they became more abundant with vegetational increases in the channel. The growth of warmouth and white catfish in the channel appears to equal or possibly surpass some natural waters. (EIS-Deal)
W79-01448

EFFECT OF COMPLEXATION BY NATURAL ORGANIC LIGANDS ON THE TOXICITY OF COPPER TO A UNICELLULAR ALGA, MONOCHRYSIS LUTHERI,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
W. G. Sunda, and J. M. Lewis.
Limnology and Oceanography, Vol. 23, No. 5, p 870-876, 1978. 3 fig, 4 tab, 14 ref.

Descriptors: *Copper, *Toxicity, *Aquatic algae, Chemical properties, Chemical reactions, Chemical analysis, Water analysis, Copper sulfate, Water chemistry, Growth rates, Reproduction, Phytoplankton, Productivity, *Ligands, *Complexation, Detoxification.

The effect of copper on the division rate of a unicellular alga was tested in media with different concentrations of natural organic ligands. Filtered river water containing a high concentration of organic matter was added in different proportions to culture media to vary the level of copper complexation. Increased binding of copper by natural ligands was associated with decreased toxicity of a given concentration of added CuSO4. The decrease in copper toxicity with increasing complexation could be explained quantitatively in terms of a dependency of toxicity on the concentration of free cupric ion. These results indicate that complexation of copper by organic ligands should considerably influence the toxicity of copper in natural waters through the effect of such complexation reactions on free cupric ion concentrations. (EIS-Deal)
W79-01449

ON THE PHARMACOLOGICAL EFFECTS OF DIISOPROPYLNAPHTHALENE ON YELLOW-TAIL (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan). Lab. of Physiology and Pathology.
H. Ozaki, and Y. Ikeda.
Journal of the Tokyo University of Fisheries, Vol. 62, No. 2, p 147-157, 1976. 6 tab, 1 pl, 6 ref.

Descriptors: *Toxicity, *Fish diseases, Organic compounds, Animal pathology, Cytological studies, Enzymes, Lipids, Fish physiology, Animal metabolism, Biochemistry, Nitrogen compounds, Chemical properties, *Tissue analysis, *Yellowtail, *Seriola, *DIPN.

The pharmacological effects of diisopropylnaphthalene (DIPN) on yellow-tail were examined anatomically, hematologically, and hematochemically at 14 and 27 days after a single intraperitoneal injection. The main symptoms observed were hypertrophy of the liver, spleen, kidney, and digestive tube, erosion of liver parenchyma, intraperitoneal congestion, and adhesion and frosted liver and spleen, suggesting the toxic chronic peritonitis. The hematological symptoms were not significant, but the serum levels of certain enzyme activities, nitrogenous compounds, lipids, and minerals were altered significantly indicating disorders of liver and kidney, in accordance with the results obtained in the mammals administered DIPN orally or intraperitoneally. (EIS-Deal)
W79-01450

EFFECT OF DIBASOL AND VITAMIN B12 ON THE LARVAE OF AURELIA AURITA (SOYPHOZA) IN A REDUCED SALINE MEDIUM,
Akademiya Nauk SSSR, Leningrad. White Sea Biological Station.
V. Y. Berger.
The Soviet Journal of Marine Biology, Vol. 3, No. 5, p 358-363, 1977. 5 fig, 5 tab, 11 ref. (Translation from the Russian).

Descriptors: *Resistance, *Salinity, *Jelly fish, *Alcohols, Larval growth stage, Sea water, Vitamins, Nutrient requirements, Adaptations, Aquatic populations, Proteins, Biochemistry, Metabolism, Cytological studies, Toxicity, Mortality, Bioassays, *Dibasol, Aurella aurita.

The acclimation of jelly fish larvae (Aurelia aurita) to diluted sea water (14%) increased their tolerance and resistance to low salinity and decreased resistance to ethyl alcohol. The administration of solutions of dibasol and vitamin B12 in concentrations of the order of 1.0 microg/ml to planulae produced a slight additional increase intolerance to low salinity. At the same time their alcohol resistance sharply increased in comparison with the tolerace of planulae which were not given theis treatment. The author examined the role of protein synthesis in the processes of phenotypical adaptations to salinity and differences in the mechanisms of specific and nonspecific reactions. (EIS-Deal)
W79-01451

ACUTE EFFECTS OF UNDERWATER CONSTRUCTION BLASTING ON FISHES IN LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
G. C. Teleki, and A. J. Chamberlain.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1191-1198, 1978. 4 fig, 3 tab, 17 ref.

Descriptors: *Mortality, *Explosions, *Fishkill, Explosives, Rock excavation, Fish physiology, Construction, Harbors, Animal pathology, Hydraulic properties, Fluid mechanics, Fish populations, Sediments, Turbidity, Lake Erie, Dissolved carbon dioxide, Trauma, Fish morphology, Underwater construction blusting.

We detonated 201 blasts with a high explosive Hydromex) in 4-8 m of water in Naticoke, Lake Erie. Shortly after each blast turbidity ad CO2 concentrations increased markedly returning to ambient levels within 3 h of the blast. Postblast pressure and charge weight were directly related. Common blast-induced injuries were swimbladder ruptures and hemorrhaging in the coelomic and pericardial cavities. Laterally compressed species were more susceptible to blast pressure gradients than were the fusiform fishes. Temporarily, surface mortalities were high only in the spring and late summer. Spatially, 57% of the total blast mortality was not visible from the water surface. (EIS-Deal)
W79-01452

IMPORTANCE OF ALGAE IN THE DIET OF THE OLIGOCHETES LUMBRICULUS VARIEGATUS (MULLER) AND RHYACODRILUS SODALIS (EISTEN),
Environmental Protection Service, Yellowknife (Northwest Territories).
J. W. Moore.
Oecologia, Vol. 35, p 357-363, 1978. 2 fig, 1 tab, 26 ref.

Descriptors: *Oligochaetes, *Food habits, Seasonal, Animal behavior, Aquatic algae, Eutrophication, Aquatic populations, Sediments, Productivity, Trophic level, Detritus, Primary productivity, Cytological studies, *Lumbriculus, *Rhyacodrilus, *Tissue analysis.

The importance of algae in the diet of the oligochaetes Lumbriculus variegatus and Rhyacodrilus sodalis was determined from collections made in a eutrophic bya. During the summer, algae represented 70-85% ofthe gut contents of both species. Almost all species were consumed in proportion to their abundance in the environment. The high level of algal consumption exhibited by the oligochaetes was primarily related to the large standing crop of algae on the sediments. During the winter, when algal densities were low in the environment, detritus and associated bacteria were the major food source. (EIS-Deal)
W79-01453

EFFECT OF THERMAL SHOCK ON PREDATOR AVOIDANCE BY LARVAE OF TWO FISH SPECIES,
Environmental Research Lab., Narragansett, RI.
C. F. Deacutis.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 632-635, 1978. 1 tab, 22 ref.

Descriptors: *Water temperature, *Resistance, *Predation, Prey fish, Larval growth stage, Thermal pollution, Heated water, Killifishes, Fish behavior, Fish physiology, Water pollution effects, Toxicity, Bioassay, Laboratory test, *Thermal shock, *Paralichthys, *Menidia.

Larvae of two fish species, Menidia menidia and Paralichthys dentatus, were subjected to a 15-min thermal shock of 10C above acclimation temperature, returned to acclimation temperature and exposed to a predator, Fundulus majalis. Four- and six-week-old M. menidia were significantly more vulnerable to predation after being shocked than control larvae, but younger larvae were not. Shocked larvae of P. dentatus were less susceptible to predation than control larvae. (EIS-Deal)
W79-01454

CHRONIC EXPOSURE OF CHINOOK SALMON EGGS AND ALEVINS TO GAMMA IRRADIATION: EFFECTS ON THEIR RETURN TO FRESHWATER AS ADULTS,
Washington Univ., Seattle. Coll. of Fisheries.
W. K. Hershberger, K. Bonham, and L. R.

Donaldson.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 622-631, 1978. 4 tab, 22 ref.

Descriptors: *Chinook Salmon, *Irradiation, *Gamma rays, *Radioactivity effects, Fish eggs, Fry, Radiation, Growth rates, Mortality, Fish reproduction, Spawning, Fertility, Sterility, Fish populations, Radiosensitivity, Radiobiology.

Chinook salmon eggs and alevins were exposed to various levels of continuous gamma irradiation to determine the level at which the return of these individuals as adults would be affected. Large number of eggs (63,000 to 140,000) were used for each treatment, along with an equal number of controls. The dose rate ranged from 0.5 R/day in 1960 to 50 R/day in 1970; dose rate approximately doubled in each of the later years. After rearing for about 90 days, the control and irradiated groups were differentially marked and released for their migration to salt water. On their return, 2 to 6 yr later, length, weight, and sex data were determined on each adult salmon. No significant change was noted in adult returns until irradiation levels of 10 R/day and above were used. At these levels, analyses showed retardation in growth and increased mortality of the small salmon in fresh water, decreased numbers of adults returning to spawn, increased age at return, and apparent sterility in the adult males. The dose-response relationship did not appear to be linear. (EIS-Deal)
W79-01455

CHLORINE EFFECTS ON LARVAL DEVELOPMENT OF STRIPED BASS (MORONE SAXATILIS), WHITE PERCH (M. AMERICANA) AND BLUEBACK HERRING (ALOSA AESTIVALIS),
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. P. Morgan, Jr., and R. D. Prince.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 636-641, 1978. 2 fig, 1 tab, 15 ref.

Descriptors: *Chlorine, *Toxicity, *Striped Bass, *Whte Perch, *Herring, Larval growth stage, Growth rates, Bioassay, Chlorination, Fish eggs, Fish populations, Hatching, Fish physiology, *Biocides, *Mutagens.

Eggs of striped bass, white perch, and blueback herring were exposed to a series of total residual chlorine (TRC) concentrations until hatching occurred. larval development of the three species was inhibited by increasing TRC concentrations. Length of larval fish at hatch decreased with increasing TRC concentrations and the production of abnormal blueback herring larvae with increasing TRC concentrations. (EIS-Deal)
W79-01456

THE INFLUENCE OF TEMPERATURE AND SALINITY ON THE TOXICITY OF HEXAVALENT CHROMIUM TO THE GRASS SHRIMP PALAEMONETES PUGIO (HOLTHUIS),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology.
R. R. Fales.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, no. 4, p 447-450, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Toxicity, *Chromium, *Shrimp, *Water temperature, *Salinity, Mortality, Bioassay, Animal physiology, Animal metabolism, Food webs, Laboratory tests, Seasonal, Water pollution effects, Animal behavior, *Grass shrimp, *Palaemonetes.

The purpose of this study was to indicate the influence of temperature and salinity on the capacity of hexavalent chromium (potassium chromate) to cause physiological damage to the grass shrimp as evidenced by 48-h static bioassays performed at eight different thermo-saline combinations. The data indicate that toxicity is enhanced by increased temperature or decreased salinity. The implications are that grass shrimp are most likely to be adversely affected when the habitat is warm (summer and early autumn, thermal effluents) and the saline water is diluted (mouth of rivers, periods of heavy rainfall). (EIS-Deal)
W79-01457

CYCLING OF ELEMENTS IN DUCKWEED (LEMNA PERPUSILLA) IN AN ASH SETTLING BASIN AND SWAMP DRAINAGE SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Biology.
J. H. Rodgers, Jr., D. S. Cherry, and R. K. Guthrie.
Water Research, Vol. 12, p 765-770, 1978. 2 fig, 4 tab, 21 ref.

Descriptors: *Thermal powerplants, *Fossil fuels, *Plant physiology, *Fly ash, Thermal pollution, Coals, Heavy metals, Settling basins, Swamps, Migratory birds, Chemical analysis, Industrial wastes, Path of pollutants, Neutron absorption, Activation energy, Waste treatment, Mercury, Selenium, *Duckweed, Lemna, Bioaccumulation, Biomagnification, *Ash, *Tissue analysis.

Duckweed inhabiting a stream-swamp drainage system that received high quantities of coal ash or thermal discharges from a fossil fuel power plant, was the only abundantly occurring macrophyte. For a period of 1 yr, accumulations of 22 elements in components of this system (water, sediments, and duckweed) were determined at six stations using neutron activation analysis. Abiotic processes (e.g. settling, solution) were important in cycling some elements including heavy metals, while some potentially toxic elements (e.g. Hg and Se) were bioconcentrated by duckweek. In those stations where ash influence was greater in water and sediments, elemental uptake by duckweed was also higher. The use of duckweed as food may be a potential source of bioaccumulation or biomagnification of toxic elements by migratory wildfowl that frequent ash-impacted drainage systems. (EIS-Deal)
W79-01458

THE TOXIC EFFECT OF COPPER ON ALGAE AND ROTIFERS FROM A SODA LAKE (LAKE NAKURU, EAST AFRICA),
Norsk Inst. for Vannforskning, Blindern.
T. Kallqvist, and B. S. Meadows.
Water Research, vol 12, p 771-775, 1978. 3 fig, tab, 13 ref.

Descriptors: *Copper, *Toxicity, Photosynthesis, Growth rates, Cyanophyta, Rotifers, Aquatic populations, Alkaline water, Metals, Aquatic algae, Primary productivity, Metabolism, Africa, *Spirulina, *Soda Lakes, Kenya.

The effect of Cu(II) ions on the photosynthetic oxygen production of phytoplankton, the growth rate of the blue-green algae Spirulina platensis and the population of rotifers in water from the soda lake Nakuru in Kenya was investigated. The photosynthetic production was reduced to 80% of the control by the addition of 0.1 mg Cu 1-1 and 50% by addition of 0.15-0.20 mg Cu 1-1. The growth rate of Spirulina platensis was more affected by copper than the photosynthesis of phytoplankton. The rotifers were less sensitive to copper than the algae, but after 8 days exposure to 0.5 mg Cu 1-1 or more the population was severely affected. (EIS-Deal)
W79-01459

INFLUENCE OF SEDIMENT IN COPPER TOXICITY TESTS WITH THE POLYCHAETE NEANTHES ARENACEODENTATA,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5A.
W79-01460

EXPERIMENTAL STUDY ON THE CONCENTRATION PROCESS OF TRACE ELEMENT THROUGH A FOOD CHAIN FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Okayama Univ. (Japan). Inst. for Agricultural and Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01461

MORTALITIES OF PEN-REARED SALMON ASSOCIATED WITH BLOOMS OF MARINE ALGAE,
Fisheries and Marine Service, Nanaimo (British Columbia). Pacific Biological Station.
G. R. Bell, W. Grifficen, and O. Kennedy.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974. p 58-60. 1 tab, 1 ref.

Descriptors: *Aquiculture, *Mortalities, On-site-investigations, *Algae, Diatoms, Sockeye salmon, Bioassays, Fish hatching, *Marine algae, *Fish culture, Pan-reared salmon, Fish diseases, Chaetoceros.

Mortalities of pen reared sockeye salmon, in the marine environment were associated with certain algal blooms. The gills of dead fish were covered with an olive green scum and the gill lamellae were surrounded with diatomaceous algae, mostly Chaetoceros. (EIS-Deal)
W79-01462

AMMONIA PRODUCTION RATE AND ITS APPLICATION TO FISH CULTURE SYSTEM PLANNING AND DESIGN,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
P. B. Liao.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974, p 107-114.

Descriptors: *Aquiculture, *Fish hatcheries, *Fish production, Fish establishment, *Fish farming, Foods, Growth rate, Design criteria, Design data, *Ammonia, *Dissoved oxygen, Fish food, Water purification, Water requirements, Fish physiology.

Oxygen consumption and ammonia proudction rates must be taken into account in determining water requiremenets for any fish culture system. The paper is intended to briefly summarize ammonia production rate and its application in fish culture system planning and design. (EIS-Katz)
W79-01465

THE IMPACT OF LOGGING ON SALMONID RESOURCES IN THE PACIFIC NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 4C.
W79-01466

WASTE HEAT AQUACULTURE,
Kramer, Chin and Mayo, Inc., Seattle, WA.
K. W. Watters.
In: Twenty-Eighth Northwest Fish Culture Conference, Dec. 6-8, 1977, Olympia, Wash., p 94-99.

Descriptors: *Aquiculture, Shrimp, Lobsters, Fish conservation, *Fish farming, *Fish establishment, Fish hatcheries, Oysters, Catfish, Fish reproduction, *Water temperature, Thermal powerplants, Thermal water, Thermal power, *Vermont Yankee Facility, *Waste heat aquaculture, Salmonid aquaculture.

The possibilities and problems of using the waste heat derived from thermal electrical generation plant for aquaculture are discussed. Existing facilities for raising shrimp, lobsters, catfish, oysters, freshwater shrimp and salmon are described. The proposed Vermont Yankee salmon rearing facility are discussed in detail. (EIS-Katz)
W79-01467

THE AVAILABILITY OF SEDIMENT-BOUND COBALT, SILVER, AND ZINC TO A DEPOSIT-FEEDING CLAM,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W79-01468

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
R. K. Stewart, and D. R. Tangarene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 545, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-910-8-77-100, 78 p, May 1977. 7 fig, 7 tab, 1 app, 5 ref.

Descriptors: *Commercial shellfish, *Food processing industry, *Water quality standards, *Water analysis, Shrimp, Alaska, Water quality control, Water quality, Water chemistry, Chemical analysis, Commercial fishing, Bottom sediments, Effluents, Waste water disposal, Waste disposal, Solid wastes, Water pollution sources, Water pollution effects, Dutch Harbor, Alaska.

Because of the large volume of shellfish processed and associated wastes produced it was determined that information on the water quality effects of waste discharges by shellfish processors should be gathered. Seafood processing waste discharges were found to be primarily responsible for the observed depressed oxygen concentrations and increased nutrient concentrations. Seafood waste discharges have been and continue to be largely responsible for the formation of sludge deposits in the Dutch Harbor embayment. Recommendations for water quality improvement were presented. (EIS-Deal)
W79-01469

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
G. E. Glass, W. M. I. Strachan, W. A. Wilford, F. A. I. Armstrong, and K. L. E. Kaiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 769, Price codes: A02 in paper copy, A01 in microfiche. The Waters of Lake Huron and Lake Superior, Vol. 3 (part B), ch 6.4, p 417-502, 1977, Report to the International Joint Commission by the Upper Lakes Reference Group. 42 ref.

Descriptors: *Pollutants, *Organic compounds, *Lake Superior, *Water pollution sources, *Water pollution effects, Polychlorinated biphenyls, DDT, Dieldrin, Aldrin, Chlorinated hydrocarbon pesticides, Pesticide residues, Great Lakes, International Joint Commission, Biodegradation, Degradation(Decomposition), Toxicity, Poisons, Taste, Odor, Bioaccumulation, Phenols, Fallout, Pulp and paper industry, Lakes.

Organic pollutants, which may constitute the most widespread waste loadings in waters of Lake Superior, are classified and their effects evaluated. There are essentially three categories: (1) compounds that readily degrade biologically or chemically; (2) less readily degraded compounds which may be directly toxic to aquatic life or consumers, may be bioconcentrated to toxic levels, or may be metabolized to a more toxic form and stored in higher organisms (such as PCBs); and (3) compounds which cause taste and odor problems in domestic water supplies or fish (such as phenols). Dispersion of persistent organic pollutants occurs both within the lake and through atmospheric transport. Continuation of pollution by toxic organics could result in loss of the fisheries. Excessive levels of taste- and odor-causing compounds are traceable to pulp and paper mills. Conclusions: (1) there should be a total ban on PCBs, aldrin, dieldrin, and DDT and its derivatives; a and (2) there should be no increased manufacture, use, or discharge of such other man-made organics as halogenated hydrocarbons until effects are fully understood. Specific contaminats contaminants covered are: PCBs, DDT and its metabolites, aldrin plus dieldring, hexachlorobenzene, Lindane, chlordane, methoxychlor polynuclear aromatic hydrocarbons, chlorobenzene conpounds, phenols, phthalate esters, chloronorbornene, octachlorostyrene, methylbenzothophene, biphenyl, endosulfan, cyanide, and heptachlorepxide. (Lynch-Wisconsin)
W79-01471

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W79-01473

A DYNAMIC WATER QUALITY MODEL OF LAKE BIWA - A SIMULATION STUDY OF THE LAKE EUTROPHICATION,
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
S. Ikeda, and N. Adachi.
Ecological Modelling, Vol. 4, No. 2-3, February 1978, p 151-172. 19 fig, 2 tab, 12 ref.

Descriptors: *Eutrophication, *Mathematical models, *Lake Biwa(Japan), *Water quality, *Dynamic models, *Cycling nutrients, Nutrients, Nitrogen, Phosphorus, Japan, Lakes, Model studies, Simulation analysis, Potable water, Water supply, Water pollution effects, Analytical techniques, Ecosystems, Phytoplankton, Algae, Yodo River Basin(Japan), Water management, Water level fluctuations, Water temperature, Discharge(Water).

A dynamic simulation model of nitrogen and phosphorus cycles in Lake Biwa, Japan's largest lake, was developed to study eutrophication phenomena and to assist with future control policy for protection of the lake ecosystem. The model is a five-block system, consisting of three geographic components (two in the larger Northern Lake and one in the Southern Lake) and two depth layers in each of the blocks of the Northern Lake. Temperature and water quality are assumed to be uniform within each block. External effects, such as water temperature, nutrients, and water outflow have great effects on the model. If the inflow of nutrients continues to increase the plankton will also increase, gradually leading to saturation. It is therefore imperative to remove as much nutrient as possible before it flows into the lake. A sudden and rapid variation in outflow from the Sourthern Lake may cause a drastic phytoplankton bloom, and the preliminary simulation study indicates that the water utilization project in Lake Biwa must be examined from the viewpoint of ecological stability in the nutrient cycle. The simulation compared well with observed data, except that predicted phytoplankton bloom period and extent, and ratio of organic to inorganic nitrogen were high. The lake is the origing of the Yodo River which supplies drinking water to 12 milion people and industrial water to the economic center of western Japan. (Lynch-Wisconsin)
W79-01475

USE OF UNICELLULAR ALGAE FOR EVALUATION OF POTENTIAL AQUATIC CONTAMINANTS,
California Univ., Irvine.
For primary bibliographic entry see Field 5A.
W79-01476

NUTRIENT RECOVERY FROM FARM PONDS: HYDROPONIC PLANT PRODUCTION AND OTHER MEANS, A REVIEW,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
L. J. McBride, and R. G. Menzel.
Agricultural Research Service, S-177, May 1978. 11 tab, 222 ref.

Descriptors: *Reviews, *Nutrient removal, *Farm ponds, *Hydroponics, *Eutrophication, *Aquiculture, *Beneficial use, *Biocontrol, Aquatic weeds, Plants, Half-saturation constant, Limiting factors, White amur, Ctenopharyngodon idella, Fish, Algae, Phytoplankton, Nutrients, Water pollution control, Nonpoint pollution, Hydrogen ion concentration, Nutrient requirements, Plant growth.

Literature on several methods for recovering nutrients from eutrophic farm ponds were reviewed with most attention devoted to culturing terrestrial plants in a hydroponic system leading to a high cash value crop. Other methods considered were direct utilization of aquatic weeds and use of a monoculture such as fish or algae. Comparison of nutrient-absorbing capabilities of various plant species using the half-saturation constant, K sub m, showed that many terrestrial species have an advantage over mot phytoplankton species in potassium uptake, compete about equally for phosphate, and are disadvantaged in nitrate uptake. Phosphate and nitrate are most likely to be limiting nutrients in farm ponds. For successful hydroponic culture, stirring and pH control would probably be necessary; alkaline pH lessens nitrate and phosphate uptake. Terrestrial plants will not remove sufficient phosphorus from farm ponds to limit phytoplankton blooms. Terrestrial plants studied included various grains, vegetable crops, and pasture species. Most species would grow poorly to moderately well due to inadequate phosphate concentration in ponds, and in some cases to insufficient nitrate levels. Direct utilization of aquatic weeds or algal monocultures have limited immediate potential due to high costs of harvesting and drying, low cash value of by-products, and possible need to add nutrients to ponds to sustain production. Harvesting of fish is not an efficient nutrient removal method. An algal monoculture would face similar problems to direct aquatic weed utilization. (lynch-Wisconsin)
W79-01477

5D. Waste Treatment Processes

NITROGEN AND PHOSPHORUS BEHAVIOR DURING AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
M. Farmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 670, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, January 1977. 67 p. 5 fig, 11 tab, 35 ref, 2 append. OWRT A-037-NH(2), 14-31-0-01-4029.

Descriptors: Nitrogen cycle, Chemical reaction, Waste water treatment, Activated sludge digestion, *Sludge digestion, Aerobic treatment, *Aerobic digestion, Feed modes, Digester, Stabilization of wastewater sludges.

Experimental results indicate that significant amounts of solid phase nitrogen and phosphorus are released to the supernatant during aerobic digestion of waste activated sludge. These findings differ from results reported by other investigators who studied digestion of primary sewage sludge. Nitrification is likely to occur during aerobic digestion of activated sludge. This will result in consumption of digester alkalinity and a tendency for pH to drop. Denitrification can also occur. Digested sludge suspended solids contained about 2.0% phosphorus and 6 to 7% nitrogen. Aerobic digestion of waste extended aeration activated sludge was conducted in laboratory scale digesters to investigate the fate of nitrogen and phosphorus during aerobic stabilization. Digestion was performed at 20C with both batch and continuous (daily draw ad fill) feed modes of operation. Experimental data were analyzed in light of knowledge of nitrogen and phosphorus in activated sludge and biological nitrification and denitrification. Predicting the release of solid phase nitrogen and phosphorus to the digester supernatant, and differences between aerobic digestion of activated sludge and primary sludge were also considered.
W79-01003

RECOVERY OF NITROSAMINES FROM WATER,
Cornell Univ., Ithaca, NY. Lab of Soil Microbiology.
M. M. Nikaido, D. Dean-Raymond, A. J. Francis, and M. Alexander.
Water Research, Vol. 11, p 1085-1087, December

1977. 3 tab, 8 ref. OWRT A-055-NY(2), 14-31-0001-5032, 14-34-0001-6033.

Descriptors: *Water sampling, *Water pollution control, Lakes, Toxicity, Sewage effluents, Gas chromatography, *Resins, *Amberlite XAD-2 resin, Waste water treatment, Chemical precipitation, *Nitrosamines, Natural waters, Carcinogens, Distilled water.

A method was devised for the recovery of dialkylnitrosamines in the parts/10 to the 9th power level. The procedure involved the addition of K2CO3 to water samples and concentration of the nitroso compounds on Amberlite XAD-2 resin. The recoveries of dimethyl- and diethylnitrosamines were greater than 90%.
W79-01006

ELECTROCHEMICAL PURIFICATION OF WASTEWATERS, CONTAINING POLYESTER RESIN (ELEKTROKHIMICHESKAYA OEHISTKA STOCHNYKH VOD, SODERZHASHCHIKH POLIEFIRNUYU SMOLU),
G. I. Fishman, I. D. Pevzner, and N. D. Melent'eva.
Plasticheskie Massay, No. 5, p 61-62, 1978. 2 fig, 6 ref.

Descriptors: *Chemical wastes, *Electrochemistry, *Resins, *Flocculation, *Dewatering, Anodes, Sodium chloride, Electrolysis, Chlorine, Coagulation, Separation techniques, Aluminum, Waste water treatment, Disinfection, Industrial wastes.

Laboratory studies examined the feasibility of electrochemical purification of polyester resin-vearing effluents generated during the manufacture of these resins and in aluminum foundries. The model waste water used in the experiments contained 650-3,000 mg/liter polyester resin. After homogenization, 10% solutions of sodium hydroxide and aluminum sulfate or aluminum chloride were added to the waste water for flocculation. The solids were separeated out and dewatered mechanically. After a 10% solution of sodium chloride was added, the clarified waste water, containing dissolved polyester resin, was treated electrochemically with a lead dioxide anode. The polyester resin was decomposed into carbon dioxide and water during electrolysis. The treated effluent, containing active chlorine, was an acceptable agent for disinfecting other waste waters. (Takacs-FIRL)
W79-01066

HYDROGEN RECOVERY FROM PURGE GAS OF AMMONIA PLANTS,
Fertiilzer Association of India, Trombay.
K. S. Chari.
Chemical Age of India, Vol. 29, No. 4, p 283-285, April, 1978. 1 fig.

Descriptors: *Ammonia, *Hydrogen, *Adsorption, *Absorption, *Sieves, Condensers, Cryogenics, Equipment, Design data, Cooling, Distillation, Separation techniques, Pressure, Waste water treatment, Industrial wastes.

Three different systems for recovering hydrogen from purge gas have been developed by Union Carbide Corp. and Petrocarbon Developments. Union Carbide's Ammonia Vent Recovery system, suitable for plants with capacities of 1,000 tons/day or more, throttles purge gas up to 50-75 kg/sq cm and either absorbs ammonia into water in an absorption tower or condenses it by cooling to an anhydrous product. The purge gas is chilled and condensed in a cold box where 85-95% of the hydrogen is recovered and returned to the synthesis loop; the fuel gas stream, bearing argon and methane, is passed to the reformer burners. Union Carbide's Pressure Swing Absorption system for 700 ton/day plants is a single-step process which uses four units for selective adsorption ad desorption of inert gases. One unit provides continuous adsorption of product flow; the remaining three operate at various stages of depressurization, regeneration by sweeping impurities from the vessels at reduced pressure, and repressurization. Nitrogen must be added to all of the systems to maintain the appropriate hydrogen to nitrogen ratio. Petrocarbon Developments' hydrogen recovery unit incorporates pretreatment, final cleanup, and cryogenic separation. Ammonia is removed from the purge gas in the pretreatment stage by vapor absorption in a packed column and distillation to anhydrous form in a reboiler. In the final clean up, purge gas is filtered through a two-bed molecular sieve; this is followed by a cryogenic separator equipped with an aluminum alloy plate, a tin heat exchanger, separators, and a refrigeration cycle. (Lisk-FIRL)
W79-01067

EXTRACTION OF AMMONIUM IONS FROM WASTEWATERS GENERATED IN THE PRODUCTION OF COMPOUND FERTILIZERS AND THEIR UTILIZATION BY ION-EXCHANGE METHOD (IZVLECHENIE IONOV AMMONIYA IZ STOCHNYKH VOD PROIZVODSTY SLOZHNYKH UDOBRENII IKH UTILIZATSIYA METODOM IONNOGO OBMENA),
A. Ashirov.
Zhurnal Prikladnoi Khimii, Vol. 51, No. 5, p 991-997, 1978. 4 fig, 2 tab, 5 ref.

Descriptors: *Chemical wastes, *Fertilizers, *Filtration, *Ammonia, *Ion exchange, Cations, Saturation, Phosphorus compounds, Separation techniques, Waste water treatment, Industrial wastes.

Optimum conditions for the removal and recovery of ammonium ions and other cations from waste waters generated during the manufacture of compound fertilizers were studied and an ion exchange treatment process was developed. The waste water to be treated was first passed through a quartz sand filter for the removal of suspended matter. Ammonium ions and other catios were extracted by upflow through a series of continuous ion exchange columns. Upon saturation, the ion exchange resing was regenerated by treatment with 20-40% phosphoric acid. The ammonium phosphate solution obtained was recycled in the production of ammonium phosphate fertilizer. (Takacs-FIRL)
W79-01068

PHOTO-DECOMPOSITION OF AQUEOUS SOLUTIONS OF PHENOL (FENOORU SUIYOEKI NO HIKARI BUNKAI),
K. Aisaka, and S. Suzuki.
Kankyo Gijutsu, Vol 7, No. 4, p 314-319, 1978. 10 fig, 1 tab, 15 ref.

Descriptors: *Phenols, *Irradiation, *Degradation(Decomposition), *Heavy metals, *Chemical wastes, Rivers, Acidity, Nitrates, Chlorides, Sulfur compounds, Trace elements, Copper, Iron, Manganese, Zinc, Waste water treatment, Industrial wastes.

Photochemical decomposition of phenolic solutions by mercury lamp irradiation was measured in the presence of other substances and in river water. An 0.00001 M solution of phenol was reduced by 90% through exposure to high-pressure mercury lamp irradiation for 150 min. The pseudo-order of the reaction was pH dependent, ranging 0.85-0.92; phenolic decomposition increased in acidic solutions. Degradation in acidic solutions was further influenced by the type of acid involved, i.e. sulfuric, hydrochloric, or nitric acid. The type of basic solution did not appear to affect phenol decomposition. Nitric acid had a significant impact upon phenol reduction. The influence of zinc, copper, iron, manganese, and chloride ions on phenol decomposition was also examined. Iron enhanced phenol decomposition, while copper reduced the removal rate. The higher initial decomposition rate of phenol in river water was attributed to the influence of COD, BOD, and trace metal concentrations. Hydroquinone was identified by liquid chromatography as a by-product of phenol degradation. (Lisk-FIRL)
W79-01069

WASTEWATER PROBLEMS IN THE FOOD PROCESSING INDUSTRY IN THE LIGHT OF MODERN WATER MANAGEMENT (AZ ELELMISZERIPAR SZENNYVIZ-PROBLEMAI A KORSZERU VIZGAZDALKODAS TUKREBEN),
Elelmezesi Ipar, Vol. 32, No. 6, p 201-208, 1978. 4 fig, 6 tab, 12 ref.

Descriptors: *Food processing industry, *Activated sludge, *Nutrient requirements, *Biological treatment, *Chlorination, Ozone, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus, Nitrogen, Percolation, Waste water treatment, Industrial wastes.

Modern waste water and sludge treatment methods utilized by the Hungarian food processing industry are reviewed. The BOD level of effluents generated in the food processing industry ranges over 40-3,000 mg/liter and COD over 1,500-7,800 mg/liter. Mechanical treatment may achieve a removal efficiency of 5-30%. Following mechanical treatment, the waste water may be subjected to biodegradation under aerobic conditions in activated sludge plants or under partially aerobic conditions in ponds. Adequate supplies and phosphorus are essential for the growth of microorganisms. Trickling filtes are characterized by low energy consumption (0.2 kWh/kg BOD) at fairly high performance (3-5 kg BOD/sq m/day). In the third stage, residual pollutants may be further removed by biological or physicochemical methods. If necessary, pathogenic microorganisms can be destroyed by chlorination or ozonation. After conditioning, the sludge generated in the treatment process is dewatered by means of filters or centrifuges. Waste waters other than those generated by the meat processing industry, in particular slaughterhouses, are usually amenable to farmland application without spcial treatment. (Takacs-FIRL)
W79-01071

WASTEWATER TREATMENT IN THE SUGAR INDUSTRY (II) (ABWASSERAUFBEREITUNG DER ZUCKERWARENINDUSTRIE (II)).
Zucker- und Suesswaren Wirtschaft, Vol. 31, No. 6, p 253-256, June, 1978. 6 fig, 4 tab, 5 ref.

Descriptors: *Sugar corps, *Food processing industry, *Water reuse, *Activated sludge, *Filtration, Centrifugation, Separation techniques, Biological treatment, Heat transfer, Organic wastes, Emulsions, Aeration, Waste water treatment, Industrial wastes.

Waste water characteristics and treatment processes in the sugar industry are described. The overall waste water load can be reduced through recirculation of warm waste waters and by reuse of cooling water as process water. Solids can be separated for recycling by filtration and centrifugation. Dissolved or emulsified organic matter can be biologically degraded. Biological treatment is generally in the form of trickling filtration or the activated sludge process with aeration. Principles of trickling filtration are described and complemented by design data for two trickling filter systems. Design criteria, operating requirements, and associated costs are provided for a model, medium sized sugar refinery using the oxygen-activated sludge process. (Takacs-FIRL)
W79-01072

DETERMINATION OF THE BICHROMATE OXIDIZABILITY OF SUGAR FACTORY EFFLUENTS (OPREDELENIE BIKHROMATNOY OKISLYAEMOSTI STOCHNYKH VOD SAKHARNOGO ZAVODA),
For primary bibliographic entry see Field 5A.
W79-01074

SEWAGE FROM THE YEAST INDUSTRY: ITS NATURE AND ITS PURIFICATION (ABWASSER DER HEFEINDUSTRIE, BESCHAFFENHEIT UND REINIGUNG),
H. Ruffer.
Industrieabwaesser, p 46-51, June, 1978. 1 fig, 5 tab, 14 ref.

Descriptors: *Yeasts, *Food processing industry, *Sulfates, *Waste dilution, *Anaerobic conditions,

Odor, Sewers, Oxidation, Decomposing organic matter, Irrigation, Return flow, Groundwater, Evaporation, Feeds, Waste water treatment, Waste water disposal, Industrial wastes.

The state-of-the-art of waste water treatment by the yeast industry of West Germany is described. Although they are free of toxic substances, yeast manufacturing effluents are characterized by a COD level of 5,000-25,000 mg/liter and a BOD of 4,000-20,000 mg/liter. The effluents are usualy discharged into a municipal sewer system. Rapid dilution is required to prevent corrosion of the sewer pipes by sulfate, the development of anoxic conditions, and the resulting release of malodorous substances upon rapid decomposition. Fouling can be prevented by the addition of oxidants at the source. Waste waters from the yeast industry can generally be used for irrigation without any risk of groundwater contamination. In some modern plats, effluents are concentrated by evaporation and the residual vinasse used as an additive for cattle feed. (Takacs-FIRL)
W79-01075

PREPARATION OF COPPER PRECIPITATE FOR ELECTROLYTIC COPPER RECOVERY FROM ELECTROPLATING INDUSTRY WASTEWATER (DENKI MEKKI KOJO HAISUI KARA NO DO NO DENKAI KAISHU O MOKTEKI TO SHITA DO CHINDEN NO SEISEI HOHO),
H. Nawafune, S. Mizumoto, and M. Kawasaki.
Kizoku Hyomen Gijutsu, Vol. 29, No. 9, p 34-38, 1978. 6 fig, 2 tab, 3 ref.

Descriptors: *Chemical precipitation, *Copper compounds, *Electrolysis, *Separation techniques, Industrial wastes, Recycling, Copper sulfate, Filtration, Carbonates, Alkali metals, Sludge treatment, Waste water treatment.

Studies were performed to devise a method for precipitating copper ions from electroplating effluents which would yield a product amendable to electrolytic recovery of the copper. Requirements for the precipitate were a low water content and a high filtration rate. Sodium hydroxide, sodium carbonate, and sodium bicarbonate were tested as precipitants for a copper sulfate solution. The residual copper concentration and final pH of the solution and the filtration characteristics of the precipitate were measured after treatment with the three precipitating agents at temperatures of 30, 50, 70 and 80 C; initial pH values of 7, 8, 9, and 10; and cureing times covering 35 min to 168 hrs. Addition of the precipitants to the copper sulfate solutions yielded a bluish white precipitate which gradually converted to green crystalline malachite ($Cu(OH)(CO3)0-5$). This conversion to malachite was accelerated by warming. The precipitate was characterized by a high filtration rate, low water content of 20% or less, and easy recoverability by elctrolysis. Analysis of costs in Japan for chemicals, electric power, sludge disposal, and the value of the recovered copper demonstrated that a postive return could be obtained by a copper precipitation system having a capacity of 10 kg/day. (Schulz-FIRL)
W79-01076

TREATMENT OF WASTEWATERS GENERATED IN ELECTROPLATING SHOPS BY REVERSE OSMOSIS. (1. CONCENTRATION OF WASHING WATERS FROM NICKEL-PLATING PROCESSES) (OCHISTKA STOKOV GAL'VANOTSEKHOV METODOM OBRATNOGO OSMOSA (1. KONTSENTRIROVANIE PROMYVNKH VOD NIKELIROVANIYA),
Y. Y. Snukishkis, and G. A. Laumyanskas.
Trudy Akademii Nauk Litovskoy SSR, Sirya B, Vol. 1, No. 104, p 63-67, 1978. 5 fig, 3 ref.

Descriptors: *Reverse osmosis, *Nickel, *Semipermeable membranes, *Sulfates, *Membrane processes, Chlorine, Boron, Separation techniques, Selectivity, Permselective membranes, Cellulose, Fibers(Plant), Waste water treatment, Industrial wastes.

The effectiveness of reverse osmosis by means of semi-permeable cellulose acetate membranes, in the form of flat films and hollow fibers, was tested with synthetic waste waters similar to those generated in nickel plating shops. In the pressure range of 25-100 atm, the selectivity of flat membranes was 68-90% for Ni(+2), 85-90% for SO4(-2), 49-65% for C1(-), and 20-30% for B. At a concentration of 1.7 g/liter, the productivity increased from 339 to 470 liters/sq m/day as the pressure was increased from 25 to 75 atm. The selectivity of the membrane increased but the flux declined with an increase in influent strength. Hollow fiber membranes were capable of removing 77% of Ni(+2), 71% of SO4(-2), 64% of C1(-), and 26% of B at 25 atm pressure and a flow rate of 22 liters/sq m/day. (Takacs-FIRL)
W79-01077

EFFLUENT TREATMENT PLANT CLEANS UP DOWN THE VALLEYS,
Processing, Vol. 24, No. 8, p 21, 23, 24, 1978. 1 fig.

Descriptors: *Tin, *Sodium compounds, *Water reuse, *Effluent streams, *Oily water, Alkaline water, Acidic water, Chemical precipitation, Ion exchange, Resins, Filtration, Emulsions, Separation techniques, Aeration, Oxidation, Settling basins, Sands, Reclamation, Waste water treatment, Industrial wastes.

Five separate effluent streams from British Steel Corp.'s Ebbw Vale tin plating works in Gwent, Wales, are treated for recycling or discharge in a new 200,000 gal/hr treatment plant. Tin brightening quench water, containing tin and phenol sulfonic acid, is treated with 5% NaOH for pH adjustment; precipitated tin hydroxide is dewatered to 70% solids on a filter press; and acidic supernatant is recycled to the pickler rinse section of the electrolytic tining lines. Sodium dichromate rinses are recovered in a closed-loop ion exchage system; deionized water is returned to the passivation sections; both quench waters and dichromate rinses can be treated in the acidic rinse stream if necessary. A tilting plate separator removes most of the oil from emulsions originating in the cold rolling mills; chemical treatment and flotation remove the remaining oil for disposal; water flows to the acidic rinse stream. Alkaline streams are pumped directly to the acidic main stream treatment process where iron-bearing acid and sodium bisulfite reduce chromium to the trivalent state; overflow from the chromium reduction pit enters the phenol sulfonic acid oxidation stage where residual acid is oxidized by 10% H202. (Lisk-FIRL)
W79-01078

EFFECT OF COPPER AND TRI- AND HEXAVALENT CHROMIUM ON THE WORK OF AN ACTIVATED SLUDGE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
E. Bieszkiewicz, and A. Hoszowski.
Acta Microbiologica Polonica, Vol. 27, No. 2, p 147-153, 1978. 7 fig, 9 ref.

Descriptors: *Activated sludge, *Copper, *Chromium, *Inhibition, *Performance, Chemical oxygen demand, Oil industry, Oil wastes, Respiration, Toxicity, Waste water treatment, Industrial wastes.

The tolerence levels of oil refinery activated sludge microorganisms were defined for copper, trivalent chromium, and hexavalent chromium. Crude oil refinery and synthetic wastes bearing an active culture were spiked with 0.2-1.0 mg copper sulfate/liter, 0.5-75.0 mg chromium nitrate/liter, and 0.5-75.0 mg potassium dichromate/liter. The impact of the heavy metals on the performance of the activated sludge microorganisms was measured according to the COD removal efficiency. In the presence of more than 0.8 mg copper/liter, COD removal declined with increasing retention times; the sludge volume index of crude oil refinery wastes increased. In synthetic wastes bearing 1.0 mg copper sulfate/liter, COD was reduced by only 29% and the sludge volume index increased 311-320 ml/g. A significant drop from 80% COD removal efficiency was observed in the refinery waste system when trivalent chromium levels exceeded 15 mg/liter; similar results were observed with synthetic wastes and metal concentrations above 30 mg/liter. Hexavalent chromium levels greater than 30 mg/liter hindered the activated sludge performance with refinery wastes and also increased the sludge volume index; similar responses were observed in the synthetic wastes at slightly higher metal concentrations. (Lisk-firl)
W79-01079

APPLICATION OF PACKED BIOPOLAR CELL TO ELECTROLYTIC TREATMENT OF WASTE WATERS, (IN JAPANESE),
Kyoto Univ., (Japan). Dept. of Industrial Chemistry.
S. Yoshimura, A. Katagiri, and S. Yoshizawa.
Nippon Kagaku Kaishi, No. 8, p 1144-1149, 1978. 7 fig, 26 ref.

Descriptors: *Electrolysis, *Metals, *Copper, *Chemical wastes, *Activated carbon, Electrodes, Industrial wastes, Separation techniques, Waste water treatment.

An electrolytic method of treatment was tested for industrial waste waters containing heavy metals and/or cyanide. The process employed a pack biopolar cell in which particles capable of conducting a fairly high electrical field were packed between a main anode and a cathode. In an example cited, metallic copper present in the form of copper sulfate solution was deposited on activated carbon particles. The concentration of copper in the solution was rapidly reduced, reaching a minimum of about 2 mg/liter. The presence of this lower limit was attributed to anodic dissolution of deposited copper as a result of agitation by gas evolved during electrolysis. When the packed cell was tested with a potassium cyanide solution, removal of cyanide ions was rapid initially and then levelled off. The addition of a copper cyanide solution to the cell resulted in rapid cyanide decomposition, suggesting the presence of a catalytic effect on anodic oxidation. Electrolysis over a 4-hr period reduced the cyanide concentration in solution from 1,000 to 0.3 mg/liter. Favorable results were also obtained with a stable ferricyanide complex. (Schulz-FIRL)
W79-01080

FIXED-BED ELECTROLYSIS - A PROCESS FOR PURIFYING WASTE WATER CONTAMINATED WITH METALS (FESTBETTELEKTROLYSE - EIN VERFAHREN ZUR REINIGUNG METALLHALTIGER ABWASSER),
G. Kreysa.
Chemie-Ingenieur-Technik, Vol. 50, No. 5, p 332-337, 1978. 10 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Electrolysis, *Heavy metals, *Separation techniques, *Anodes, *Cathodes, Copper, Zinc, Cadmium, Palladium, Mercury, Ion exchange, Membrane processes, Metals, Waste water treatment, Industrial wastes.

Pilot plants studies of a fixed-bed electrolysis process for treating waste streams bearing heavy metals preceded installation of an automated full-scale plant for treatment of copper-bearing electroplating rinse waters. The fixed-bed electrolysis unit was designed as an alternative to hydroxide precipitation for recovering metal contaminants for reuse and for recycling electroplating wash waters. Expansion of the specific surface area of the electrode permitted high metal recovery from low strength wash water. The pilot unit contained a fixed-bed cathode, a graphite anode, and an ion exchange membrane. It was operated at a flow rate of 50 liters/hr at a metal concentration of 100 ppm. Pilot plant studies indicated that copper, zinc, cadmium, palladium, and mercury could be reduced to less than 1 ppm. The design configuration of the full-scale, fixed-bed electrolysis unit to recover copper was presented and performance during start-up was described. (Lisk-FIRL)
W79-01081

WATER CONTENT REDUCTION OF METAL-PLATING WASTE SLUDGE BY A PRESS AND CENTRIFUGE (MEKKI SURAJI NO KOKAI-TEKI DASSUI NI KANSURU KISOTEKI KENKYU),
For primary bibliographic entry see Field 5E.
W79-01082

OXIDATION OF LYES AND TREATMENT OF WASTEWATER WITH GASEOUS OXYGEN (OKISPENIE SHCHELOKOV I OBRABOTKA STOCHNYKH VOD GAZOOBRAZNYM KIS-LORODOM),
G. L. Akim.
Bumazhnaya Promyshlennost, No. 5, p 10-15, 1978. 1 fig, 17 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Oxidation, *Sodium compounds, *Sulfides, Aeration, Odor, Filtration, Digestion, Heating, Waste water treatment, Industrial wastes.

Previous studies on and practical applications of the use of oxygenation to oxidize sulfides and other malodorous organic compounds in black pulping liquors are reviewed. When oxygen is added directly to the cooker 10-15 min before the end of the digestion process, 99% of the methylmercaptan and dimethysulfide is oxidized. At an oxygen consumption of about 45 kg/ton of pulp, 90% of the sodium sulfide is oxidized. Black liquor can also be oxygenated in bulk before washing on filters; oxyen is introduced through vertical pipes in counterflow to the black liquor at a temperature of 75-85C. Complete oxidation of the sulfide is achieved at an oxygen-to-sulfide ratio of 1.25-1.35. Weak black liquor can also be oxidized in a contact chamber, preferably in two stages. The optimum temperature for black liquor oxidation is 95-110C. Sulfides are oxidized most efficiently at a liquor pH greater than 12. (Takacs-FIRL)
W79-01083

INVESTIGATIONS OF THE DECOLORATION OF WASTEWATERS GENERATED IN CONFIER SULFATE PULP MILLS (CERCETARI PRIVIND DECOLORAREA APELOR REZIDUALE PROVENITE DE LA FABRICAREA CELULOZEI SULFAT DIN RASINOASE),
M. Puiu, M. Bolohan, and R. Turchevici.
Celuloza si Hirtie, Vol. 27, No. 2, p 60-68, 1978. 12 fig, 6 tab, 6 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *color, *Sulfates, *Lime, Ion exchange, Resins, Reverse osmosis, Iron compounds, Chemical precipitation, Separation techniques, Filration, Waste water treatment, Industrial wastes.

Various chemical methods were tested for removing color from effluents generated by conifer sulfate pulp mills. These methods included: flocculation with lime, ferric sulfate, aluminum sulfate, or ferric chloride; activated carbon adsorption; treatment with ion exchange resins; and reverse osmosis. Only decoloration with lime and aluminum sulfate was found to be economically feasible for industrial-scale application. The precipitate formed during decoloration with lime was easily separated by filtration. (Takacs-FIRL)
W79-01084

LABORATORY INVESTIGATION OF WATER POLLUTION BY ORGANIC SUBSTANCES IN FLAX WASTES DELIGNIFICATION (LABORATORNE SLEDOVANIE ORGANICKEHO ZNECISTENIA VOD PRI DELIGNIFIKACII LANOVYCH ODPADOV),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W79-01085

OZONATION FOR CONTROL OF ENTERIC VIRUSES IN SEWAGE EFFLUENT,
Rhode Island Univ., Kingston. Dept. of Animal Pathology.
P. W. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 688, Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Completion Report, October 1978. 11 p, 7 tab. OWRT A-064-RI(1), 14-34-0001-8042.

Descriptors: *Ozone, Inactivation, *Enteric viruses, Sewage treatment, *Viruses, *Ozonation, *Waste water treatment.

The object was to determine guidelines for dosage and contact time of ozone with respect to virus inactivation in various types of secondary sewage effluent. It was found that the demand of ozone for the inactivation of 5 human enteric viruses, namely poliovirus type 1, 2 and 3; Coxsackie virus type B5 and Echovirus type 12 in secondary effluent from different sewage plants varied greatly. Variation also occurred during different seasons of the year within the same sewage plant. Because of these variations between and within the sewage plants, a standard recommendation of ozone dosage and contact time cannot be applied for all plants or at all times within the same plants. However, a few generalizations can be stated: (1) Ozone given at 0.9-1.1 mg per liter, at a flow rate of 3 liters per minute, took 9 minutes to inactivate all 5 human enteric viruses in secondary sewage effluent. In some sewage plants, this time requirement was much less. (2) It appeared that different enteric viruses required different ozone treatment for inactivation. For Coxsackie virus type B5, the average time for inactivation (7.7 minutes) was much longer than that for poliovirus type 2 and 3 (5.6 minutes). (3) For some unknown reason, the sewage effluents collected during the spring season from two sewage plants required much higher ozone treatment than during the summer months.
W79-01088

BIO-REGENERATION OF HYDROCARBON-EXHAUSTED ACTIVATED CARBON.
Rhode Island Univ., Kingston.
C. W. Houston.
Available from the National Technical Information Service, Springfield, VA as PB-288 651 Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Technical Completion Report (1978). 4 fig, 8 tab, 6 ref. OWRT A-063-RI(1), 14-34-0001-8432.

Descriptors: *Bio-regeneration, *Activated carbon, Adsorption, Industrial wastes, Organic compounds, Biological treatment, Waste water treatment.

Activated carbon was exhausted with either glucose hydrocarbon (nonane or decane) and regenerated biologically with Escherichia coli or Pseudomonas aeruginosa, respectively. Regeneration was carried out in aerated glass columns after the addition of a mineral medium to supply nutrients other than the carbon source adsorbed on the carbon. Glucose-exhausted carbon was restored to full adsorption capacity following growth of E. coli. It is suggested that increased surface area resulting from abrasion during regeneration and washing may have compensated for any decreased adsorption capacity due to metabolic end-products and/or adhering cells. In contrast, the adsoption capacity of hydrocarbon-exhausted carbon regenerated by growth of P. aeruginosa was reduced approximately 66%.
W79-01093

COMPARISON OF IRON (III) AND ALUMINUM IN PRECIPITATION OF PHOSPHATE FROM SOLUTION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soil and Crops.
P. H. Hsu.
Water Research Vol. 10, p. 903-907, 1976. OWRT A-042-NJ(4).

Descriptors: *Phosphates, *Waste water treatment, *Water quality, *Aluminum, Chemical precipitation.

Although both iron (III) and aluminum salts have long been considered as coagulants for precipitation of phosphate from solution, the literature have been controversial. The author found in previous studies that the optimum acidity and the effectiveness of phosphate removal reported in the literature have been controversial. The author found in previous studies that the optimum acidity and the effectiveness of phosphate removal were greatly affected by the initial ratio of phosphate to coagulants, and the presence of sulfate and calcium. The objective of this report is to interpret that the differences observed are attributed to their different affinities for phosphate and their different hydrolysing powers.
W79-01095

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
P. V. Roberts, P. L. McCarty, and W. M. Roman.
Journal of the Environmental Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. EE5, p 933-949, October, 1978. 8 fig, 6 tab, 1 append, 6 ref.

Descriptors: *Water reuse, *Reclaimed water, *Injection, *Attenuation, Ground water recharge, Waste water disposal, Saline water intrusion, Subsidence, Aquifers, Artificial recharge, Ion exchange, Water quality, Water analysis, Potable water, Water demand, Water law.

Renovating and recycling wastewater are alternate means of meeting future water demands. The Environmental and Water Studies program at Stanford University has embarked on a 3-year study concerning the changes in water quality and aquifer characteristics resulting from the injection of reclaimed water. The ultimate goal is to ascertain whether direct injection of reclaimed water is a feasible and reliable strategy for producing potable water. An advanced wastewater treatment and injection-extraction system built by the Santa Clara Valley Water District (SCVWD) not only provides reclaimed water for landscape irrigation but also inhibits saline water intrusion and subsidence. An injection pilot study at the SDVWD facility found that during passage of reclaimed water through an aquifer most contaminants were removed by various mechanisms. These include: adsorption, ion exchange, precipitation and dissolution, chemical oxidation, biological nitrification and denitrification, aerobic or anaerobic degradation of organic substrates, mechanica dispeersion, and filtration. The dominant removal mechanism is believed to be ion exchange on clays. This pilot study will provide important information regarding the retention capacity of an aquifer for attenuating the movement of a wide spectrum of inorganic, organic, and microbia pollutants. These data will by used in monitroing a full-scale well field operation. (Purdin-NWWA)
W79-01108

REMOVAL OF METALLIC IMPURITIES FROM WATER BY ELECTROCHEMICAL METHODS,
Connecticut Univ., Storrs. Inst. of Water Resources.
N. D. Greene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 687, Price codes: A02 in paper copy, A01 in microfiche. Research Project Technical Completion Report, 1978. 14 p, 2 tab, 5 fig, 7 ref. OWRT A-063-CONN(2), 14-31-0001-5007.

Descriptors: *Electrochemistry, *Heavy metals, *Water purification, Corrosion control, Waste water treatment, Water treatment, Kinetics, *Metal deposition kinetics, *Metal deposition kinetics, *Replacement reactions, *Heavy metal compounds, Electrolysis, Low cost methods, Active metal beds.

Heavy metal compounds such as mercury, copper, cadmium, lead, chromium and nickel in water and wastewater systems cause numerous problems. These include biological toxicity, enhanced corro-

sion (of aluminum) and interference with food and pharmaceutical process operations. The aim of this program was to develop new low cost methods for removing metallic impurities based on electrochemical techniques. Replacement reactions using static and fluidized active metal beds (aluminum, magnesium and zinc) were used to remove metallic impurities (such as (Hg (2+), Cu(2+), Pb(2+), Ni(2+), Co(2+), Cr(3+), Cr(6+)) from water. The results show that in many cases, this approach offers a practical method for removing metallic impurities from water and wastewater streams. (deLara-Conn)
W79-01121

A STUDY FOR IMPROVING THE AEROBIC-MEDIA TRICKLING FILTER FOR WASTEWATER TREATMENT,
West Virginia Univ., Morgantown. Water Research Inst.
W. R. Johnson, III, and C. R. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 775, Price codes: A03 in paper copy, A01 in microfiche. Information Report 12, 1978. 39 p, 13 fig, 9 tab, 25 ref, append. OWRT A-029-WVA(2), 14-31-0001-6051.

Descriptors: *Aerobic treatment, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Oxygen, Secondary treatment, Solid contact processes, Treatment, Waste treatment, Wastes, Water pollution treatment, Aerobic media, Aerobic-media trickling filter.

Improvements in the original design and additional information about the operational capabilities are demonstrated in this bench-scale study of the aerobic-media trickling filter (AMTF), a new concept of biological wastewater treatment. The uniqueness of this fixed growth system is that the inert media also provide aeration. The aerobic media consist of 276 small teflon tubes bonded into a pressurized oxygen manifold at one end of the unit and hanging in loops down the length of a vertical pipe flowing full of wastewater. Diffusion of pressurized oxygen through the very thin walls of the tubes provides the oxygen requirements. Recirculation is used to vary the hydraulic loading on the unit. Organic loading is varied by changing the concentration of the synthetic wastewater. This AMTF system accomplishes greater than 85 percent removal of BOD and is not adversely affected by excessive accumulations of slime. Its performance at high organic and hydraulic loadings indicates it would be amenable to secondary treatment of industrial and municipal wastewaters or would perform well in a roughing process. Preliminary information also indicates a large unit-volume reduction in the AMTF compared to an oxygen-activated sludge unit or a plastic media trickling filter.
W79-01123

HEAVY METAL ACCUMULATION AND ITS EFFECT ON THE BIOTA OF AN INDUSTRIAL SETTLING POND,
Montana Univ., Missoula. Dept. of Zoology.
G. F. Weisel, and M. A. Neher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 822, Price codes: A06 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No. 90, December 1977. 98 p, 23 fig, 12 tab, 53 ref. OWRT A-102-MONT(1), 14-34-001-7122.

Descriptors: *Heavy metals, Industrial waters, *Biota, Aquatic life, *Settling basins, Waste disposal, Water pollution sources, *Montana, Sediments, Distribution, Waste water treatment, *Clark Fork River(Mont), Warm Springs(Mont), Butte(Mont).

The Warm Springs settling ponds are a source of heavy metal pollution to the Clark Fork River. This study determined the levels of heavy metals in the sediments, water, and selected biota of the settling ponds and compared these to a set of control ponds. The effects these metal concentrations may have on the biota were also considered. Metal concentrations were generally higher in sediments, water, and biota of the settling pond than in control ponds. Except for Cr and Pb, values are one to two orders of magnitude greater than concentrations of the same metals in the control pond sediments. Total metal concentrations in water were less than 1 ppm in the settling ponds, but were higher than levels in the control ponds. Species diversity and the equitability of the distribution of individuals within species of the aquatic macroinvertebrate community of the settling pond were comparable to or greater than these parameters of the control pond communities. Aquatic insects predominated in the settling pond community, whereas planaria, snails, and leeches predominated in the control ponds. Differences in species composition were influenced by phytological and chemical differences between control and settling ponds. Species of biota tolerant to heavy metal concentrations in the settling ponds were identified. (Tibbs-Montana)
W79-01124

OBSERVATIONS ON ALGAL POPULATIONS AND EXPERIMENTAL MATURATION POND SYSTEM,
Council for Scientific and Industrial Research, Pretoria (South Africa).
S. N. Shillinglaw, and A. J. H. Pieterse.
Water SA, Vol. 3, No. 4, p 183-192, December 1977. 10 fig, 4 tab, 16 ref.

Descriptors: *Algae, *Tertiary treatment, Sewage treatment, *Maturation ponds, *Nutrient removal, *Ammonia, *Limiting factors, Ponds, South Africa, Water reuse, Zooplankton, Carbon, Nitrogen, Hydrogen ion concentration, Nutrients, Retention time, Chlorophyll, Species composition, Seasonal, Chlorophyceae.

Increase in ammonia nitrogen levels when pH levels are high are thought responsible for sudden population declines of algae used for nutrient removal (especially ammonia and orthophosphate) in sewage maturation ponds at Pretoria, South Africa. Zooplankton grazing and carbon deficiency at peak algal concentrations are considered secondary causes. Increasing retention time in the ponds provides a possible means of preventing algal declines, since algae could adapt to ammonia increases in the influent and alleviate acute carbon deficiency through absorption of atmospheric carbon dioxide. Algal populations exhibited marked fluctuations throughout the period of study (August 1975-July 1976) with large concentrations, which could only be maintained for brief periods followed by drastic declines. Declines in chlorophyll-a were primarily due to actual removal of algal cells from suspention through sedimentation or through the outflow. Turbidity increases resulted from increases in algal cell concentrations, implying that light limitation would only occur at peak algal cell levels. However, light limitation was apparently not a major influence since declines proceeded to such lowlevels. Dominant species during declines included both Chlorophyceae and other species, in contrast to previous studies reporting only Chlorophyceae. Water temperature may have had some effect on algal growth. (Lynch-Wisconsing)
W79-01196

EQUITABLE RECOVERY OF INDUSTRIAL WASTE TREATMENT COSTS IN MUNICIPAL SYSTEMS, FEDERAL GUIDELINES.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 437, Price codes: A03 in paper copy, A01 in microfiche. October 1971. 44 p, 1 append.

Descriptors: *Waste treatment, *Federal Government, *Cost allocation, *Standards, *Legislation, Industrial wastes, Water Quality Act, Sewage, Municipal wastes, Cost sharing, Effluents, Waste water treatment, Capital costs, Operating costs, Maintenance costs.

Federal guidelines included under Regulation 18 CFR 601.34, which are designed to ensure that the industrial share of allocatable treatment costs to be recovered is proportionate to the costs of treating industrial wastes, are supplemented and interpreted. The primary intention is to assist local and State agencies in administering the provisions of the Regulation. General provisions of the Regulation are clarified with emphasis on the scope of the provisions and criteria of acceptable compliance. The necessity for using average cost pricing being defined as the technique which allocates total system costs to attributable classes of users by establishing a uniform price per identifiable unit of discharge. A discussion of cost allocation methods includes quantity or quality formulas based on total cost of average unit costs. Also discussed are payment procedures, recovery systems and sources of revenue, and situations where inequities may arise, such as property taxes and quantity discounts. The principles described are illustrated by examples of actual calculations and the text of the Regulation 18 CFR 601.34 is included. (Majtenyi-IPA)
W79-01206

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-01210

REMOVAL AND SEPARATION OF SPILLED HAZARDOUS MATERIALS FROM IMPOUNDMENT BOTTOMS,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5G.
W79-01307

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. VOLUME 3. SUMMARIES OF TECHNICAL DATA FOR COMBINED SEWER OVERFLOWS AND STORMWATER DISCHARGE. 1976 NEEDS SURVEY,
Environmental Protection Agency, Washington, DC. Office of Water Programs Operations.
For primary bibliographic entry see Field 5G.
W79-01308

IMPLEMENTING 'BEST MANAGEMENT PRACTICES' FOR RESIDUALS: THE WASTE EXCHANGE,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W79-01309

SENSITIVITY ANALYSIS OF A PHOSPHORUS REMOVAL STRATEGY COMPUTER MODEL,
JBF Scientific Corp., Wilmington, MA.
D. A. Barnes, and D. S. Yeaple.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 415, Price codes: A09 in paper copy, A01 in microfiche. 1968. 183 p, 7 tab, 2 ref, 5 append. 68-01-1531.

Descriptors: *Mathematical models, *Computer models, *Cost analysis, *Phosphorus removal, *Sewage treatment, Data processing, Evaluation, Municipal wastes, *Wastewater treatment, Economics, Data collection.

Results of a sensitivity analysis of a computer simulation model for evaluating phosphorus removal strategies are reported. Eighteen input paramenters were analyzed for five different communities ad their respective sewage treatment plats. The findings are considered useful for determining where the greatest effort in data collection should be expended to provide realistic input data for this model. It was determined that the parameter with greatest effect in ELIMIT, the effluent level in mg/1 of phosphorus. The second greatest effect was produced by PINPS, the influent (raw waste water) total phosphorus level in mg/1. Other pa-

rameters which affect treatment costs importantly are ALUMCS, the cost of alum is $/1b. FECLCS, the cost of ferric chloride in $/1b, and MATRLS, the wholesale price index. (Majtenyi-IPA)
W79-01310

DIFFERENTIAL BED KINETIC ANALYSIS OF HEAVY METAL REMOVALS BY BIOLOGICAL SLIMES,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
R. D. Neufeld.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 636, Price codes: A12 in paper copy, A01 in microfiche. Report No. SETEC-CE-76-008, April 1976. 125 p, 53 fig, 12 tab, 27 ref, 4 append. GK 42150.

Descriptors: *Wastewater treatment, *Biological treatment, *Heavy metals, *Liquid wastes, *Sewage treatment, *Activated sludge, *Heavy metal removal, Kinetics, Equilibrium, Aqueous solutions, Mercury, Cadmium, Absorption, Separation techniques.

A study was conducted to examine the potential for the processing of heavy metal laden liquid waste with the use of biological slimes for the extraction and possible recovery of the heavy metal resource. This was accomplished by developing the operational parameters of kinetics and equilibria associated with the heavy metal removal. The two metals studied were soluble mercury, in concentrations ranging from 0.1 to 1000 mg/l, and soluble cadmium in concentrations ranging from 0.3 to 1000 mg/l. Equipment, chemicals, and experimental procedures used are detailed. Results indicate that activated sludge, typical of sewage treatment plant origin, has the capacity to remove mercury until the mercury on the floc is 12.0% by weight ratio; and cadmium, until the cadmium on the floc is 27.5% by weight ratio. In concentrations up to 30 mg/l of mercuryf and cadmium, it was found that activated sludge can sorb a higher weight fraction of liquid phase mercury than cadmium. Other factors studied included: pH, pressure drop, and behavior of glass wool, tubing and the reactor. (Gibson-IPA)
W79-01314

AN ASSESSMENT OF TECHNOLOGY FOR POSSIBLE UTILIZATION OF BAYER PROCESS MUDS,
Battelle Memorial Inst., Columbus, OH.
B. K. Parekh, and W. M. Goldberger.
Available from the National Technical Information Service, Springfield, VA as PB-266 678, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-301, December 1976. 153 p, 14 fig, 26 tab, 613 ref, 2 append. R-803760-01.

Descriptors: *Industrial wastes, *Waste disposal, *Mud, *Dewatering, *Recycling, Bayer process, Bauxite, Evaluation, Solid wastes, Waste treatment, Coagulation, Chemical properties, Beneficiation.

The possibility of using mud wastes generated in the domestic production of alumina from bauxite ores was studied. After a thorough literature search on subjects related to the technology of bauxite processing, visits were made to six alumina plants in the U.S. to observe operations and discuss mud-handling methods and utilization possibilities. Mud samples were obtained for characterization and dewatering experiments. It was concluded that there is no possibility for utilization of the muds that could significantly affect the need for impoundment within the near term. However, it does appear possible to develop improved mud dewatering and impoundment methods and a joint industry-government program of demonstration and pilot projects is recommended. Further recommendations include: (1) basic research to study the mineral surface chemistry controlling the dewatering mechanism; (2) investigations of the possible beneficiation of muds into a raw material supplement in iron making; and (3) the possible use of mud as an absorbent in pollution abatement processes. (Majtenyi-IPA)
W79-01315

AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS,
Ohio State Univ., Columbus.
E. P. Taiganides, and R. K. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 611, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA 600/2-76-240, September 1976. 151 p, 52 fig, 27 tab, 32 ref, 3 append. 1HB617, R-801125.

Descriptors: *Waste water treatment, *Solid wastes, *Farm wastes, *Recycling, Ultimate disposal, Biological treatment, Effluents, Hogs, Aerobic treatment, Waste storage, Oxidation, Agricultural engineering, Waste disposal, Fertilization, Computer models, Computer programs, Model studies, Evaluation.

A system for automatically flushing swine feedlot wastes and biological treatment and recycling of the liquid effluent was reviewed and evaluated. The procedure included: (1) hydraulic removal of wastes by flushing gutters with water from overhead siphon tanks and tipping buckets; (2) primary treatment consisting of a stabilization sump, solids separation with stationary and vibrating screens, aerobic stabilization of solids, solids storage tanks, and final disposal of settled solids on farm land; (3) secondary treatment consisting of an oxidation ditch, final clarifier, and re-use clarifier effluent as flushing liquid within the building; and (4) tertiary treatment consisting of laboratory evaluation of high-pressure driven membranes for removal of chemical nutrients from the clarifier effluent. It was concluded that such a system is both technically feasible and environmentally acceptable. In addition to the review and evaluation program, a computer program was developed to simulate operation of a biological treatment system with cropland disposal for any swine confinement production unit. This program should prove useful in providing functional design parameters and economic cost data for evaluating alternative management schemes under various cropping patterns for a given farm size and weather conditions. (Majtenyi-IPA)
W79-01316

REMOVAL OF SOLUBLE BOD SUB 5 PRIMARY CLARIFIERS,
Institute of Paper Chemistry, Appleton, WI. Effluent Processes Group.
G. A. Dubey, A. J. Wiley, and J. W. Collins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 919, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-221, September 1976. 152 p, 53 fig, 55 tab, 21 ref, 3 append. R-803119.

Descriptors: *Industrial pollution, *Waste water treatment, Sedimentation, *Biochemical oxygen demand, *Pulp wastes, Pulp and paper industry, Chemical oxygen demand, Suspended solids, Color, Flocculation, Filtration, Hydrogen ion concentration, Chemical properties, Chromatography, Efficiencies, Optimization, Surveys, Sampling, Costs.

An evaluation study was carried out on means for increasing biochemical oxygen demand (BOD) removal from primary systems treating pulp and paper wastes. Twelve mills were surveyed to obtain data on total and soluble BOD sub 5, chemical oxygen demand, suspended solids, and color removal from sedimentation systems. Based on this data, specific mill effluents were chosen for further laboratory study which showed that, using proper flocculating agents, soluble BOD removal could be increased markedly. Soluble BOD was defined as the organic load passing through a 0.45 micro m filter. Gel chromatography showed that low molecular weight biodegradable residues and colloidal materials were flocculated and removed. Also, studies using model compounds indicated that increased removal is apparently related to pH of the solution and chemical structure and solubility of the compound. Chemical costs may range from 3 cents to 10 cents per 1000 gal. It was concluded that costs can be reduced and clarifier performance can be improved by eliminating overflows and spills within the mill that result in inefficient sedimentation. (Majtenyi-IPA)
W79-01317

STATE-OF-THE-ART: MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY, VOL. III -- WASTEWATER TREATMENT,
American Defense Preparedness Association, Washington, DC.
J. Patterson, N. I. Shapira, J. Brown, W. Duckert, and J. Polson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 042, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-213c, October 1976. Vol. III of III, 181 p, 14 fig, 54 tab, 251 ref, 1 append. R-802872.

Descriptors: *Waste water treatment, *Industrial wastes, *Explosives, *Surveys, Evaluations, Pollution abatement, Water pollution, Waste water, Effluents, Solid wastes, Air pollution, Propellants, Trinitrotoluene, Water pollution sources, Nitroglycerin, Sellite, Acidic water, Technology.

A survey was conducted on the waste water treatment processes being used in the military explosives and propellants industry, including manufacturing, loading, assembly, and packing facilities. The effectiveness of various treatment technologies for water pollution abatement now in use or under investigation are described and evaluated as part of a long-term effort to modernize munitions production plants. The materials discussed include: trinitrotoluene (TNT), acetic acid and acetic anhydride, nitric acid, nitrocellulose, nitroglycerin, RDX (cyclotrimethylenetrinitramine) and HMX (cyclotetramethylenetetranitramine), sellite, and a variety of solvent and solventless propellants. Under each category, discussion is devoted to waste sources, current treatment practices, effects of water management, and modifications and alternatives to current practices. The effectiveness of pollutant removal is evaluated as well as secondary (air and solid) waste generation where appropriate. (Majtenyi-IPA)
W79-01318

RENOVATION OF INDUSTRIAL INORGANIC WASTEWATER BY EVAPORATION WITH INTERFACE ENHANCEMENT,
California Univ., Berkeley. Sea Water Conversion Lab.
H. H. Sephton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 025, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-017, March 1976. 67 p, 17 fig, 12 ref. R-802753.

Descriptors: *Waste water treatment, *Industrial waste, *Evaporation, *Surfactants, *Vertical tube evaporation(VTE), Interface enhancement, Powerplants, Boilers, Acid mine water, Waste water(Pollution), Crystallization, Foaming, Heat transfer, Optimization.

Improved heat transfer performance during concentration of industrial waste waters was obtained using a new method of vertical tube evaporation (VTE). This method, interface enhancement, relies on the addition of a few parts per million of a selected surfactant to waste water feed followed by imposed two-phase foamy liquid-vapor flow over the heat transfer surfaces. When applied to concentration of powerplant cooling tower blowdown and boiler blowdown, interface-enhanced VTE provided about 120% increase in usual heat transfer performance in pilot plant studies under realistic industrial conditions. When applied to acidic mine drainage water, concentrated by double-fluted titanium evaporator tubes, VTE provided about 60% performance improvement. Beneficial side effects of surfactant addition were inhibition of solute crystallization, permitting concentra-

tion of waste waters to smaller volumes. It was concluded that the interface-enhanced VTE process is technically feasible and economically attractive for application in the three waste water types investigated. (Majtenyi-IPA)
W79-01319

TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS,
Abcor, Inc., Wilmington, MA. Walden Research Div.
R. G. Donnelly, R. L. Goldsmith, K. J. McNulty, D. C. Grant, and M. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 393, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-261, September 1976. 106 p, 50 fig, 16 tab, 11 ref. R-800945-01.

Descriptors: *Waste water treatment, *Industrial wastes, *Metallurgy, *Water pollution(Treatment), *Electrolysis, Osmosis, *Membrane processes, *Reverse osmosis, Semipermeable membranes, Metal plating, Membranes, Polymers, Cellulose acetate, Polyamide, Evaluation, Nickel, Copper, Zinc, Cadmium, Chromium, Pollution abatement.

Reverse osmosis treatment of plating bath rinse waters employing a closed-loop recycling of purified water for rinsing and return of plating chemical concentrate to the bath was examined and found to be an attractive process. Three commercially available membrane configurations were evaluated experimentally: tubular (cellulose acetate), spiral wound (cellulose acetate), and hollow (polyamide). At present, spiral wound and hollow fiber configurations are preferred because they are more compact and less expensive. Choice between the two is based primarily on the pH of rinse water concentrate, with cellulose acetate being preferred from pH 2.5 to 7 and polyamide from pH 4 to 11. Neither membrane has any overriding advantage in the overlap pH region. The degree to which the recycled plating chemicals would be concentrated and the degree to which rinse waters would be purified must be determined on a case by case basis depending on factors, such as the ratio of water loss from evaporation, maximum concentration limit obtainable by reverse osmosis, and required water purity. Of the rinse waste systems evaluated, chromic acid and very high pH cyanide baths were found to be unattractive for treatment using reverse osmosis. The following systems were determined to be attractive, with specified limitations: Watts-type nickel, nickel sulfamate, copper pyrophosphate, nickel fluoborate, zinc chloride, copper cyanide, zinc cyanide, and cadmium cyanide. (Majtenyi-IPA)
W79-01320

TREATMENT AND DISPOSAL OF COMPLEX INDUSTRIAL WASTES,
Reichhold Chemicals, Inc., Tuscaloosa, AL.
C. Schimmel, and D. B. Griffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 979, Price codes: A09 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-123, November 1976. 190 p, 24 fig, 28 tab, 2 append. 12020 EGC.

Descriptors: *Industrial wastes, *Biological treatment, *Adsorption, *Activated carbon, *Waste water treatment, Oxidation, Water pollution, Temperature, Phenols, Chemical wastes, Chemical oxygen demand, Biological oxygen demand, Organic chemicals, Technology, Evaluation, Pilot plants, Waste disposal.

Using the Reichhold Chemicals, Inc. plant of Tuscaloosa, Alabama, as a model of a multi- product chemical facility, an effective biological treatment process was developed to handle both organic and inorganic wastes. The process produced a significant reduction in five day biological oxygen demand (BOD sub 5) loading, substantially complete removal of phenols, and adequate reduction in chemical oxygen demand (COD) loading. However, the biological process proved to be somewhat unreliable because of sensitivity to lower temperatures and changes in phenol concentration. As a result, an activated carbon adsorption process was developed, that resulted in average removal of 90% COD, 75% of BOD sub 5, and over 99% of phenol load in Reichhold plant wastes. It was concluded that biological oxidation should not be overlooked for treating industrial wastes although its usefulness is limited with respect to bacterial poisons, such as phenol, and ambient temperature changes that result in variable biological activity. However, carbon adsorption should not be considered if a substantial portion of the pollutant load is low molecular weight organics because they are poorly adsorbed or adsorbed not at all. (Majtenyi-IPA)
W79-01321

APOLLO COUNTY PARK WASTEWATER RECLAMATION PROJECT, ANTELOPE VALLEY, CALIFORNIA,
Los Angeles County Engineer Dept., CA.
H. T. Brandt, and R. E. Kuhns.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 997, Price codes: A06 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-022, March 1976. 341 p, 78 fig, 37 tab, 33 ref, 1 append. 17080 GCI and WRD 97-01-68.

Descriptors: *Waste water treatment, *Recreation, *Reclaimed water, *Water reuse, Water treatment, Tertiary treatment, Flocculation, Sedimentation, Filtration, Disinfection, Irrigation, Esthetics, Aquatic life, Fish environment, Parks, Recreation facilities, Conservation, Water resources, Evaporation, Soil quality.

The results of a full scale demonstration project on the economics and feasibility of reclaiming waste water for use at an aquatic park in a semi-arid area of California are presented. The project included construction of a 1900 cu m/day tertiary waste water treatment plant and a 22.7 ha (56-acre) park with recreational support facilities, and evaluation of the treatment system performance and water quality. The treatment process utilizes flocculation with alum, sedimentation, filtration, and disinfection to produce water that is pathogenically safe, esthetically pleasing, suitable for fish life and aquatic sports, and acceptable for irrigation use. However, because of high sodium levels and increases in boron and dissolved salts due to evaporation, precautions are needed to maintain soil quality, if used for irrigation. Also, because of an unforeseen natural soil condition, mercury concentrations in the fish exceeded limits set for human consumption. The completed Apollo County Park has been well accepted by the public and use was estimated at about 90,000 visitor days in the second year of operation. (Majtenyi-IPA)
W79-01324

EVALUATION OF ACTIVATED SLUDGE HYDRAULIC CONTROL TECHNIQUES THROUGH PILOT PLANT ANALYSES,
Purdue Univ., Lafayette, IN.
R. E. Roper.
Available from the National Tech
W79-01325

ECONOMIC ANALYSIS OF ALTERNATIVE SLUDGE DISPOSAL METHODS IN VERMONT,
Vermont Univ., Burlington. Dept. of Economics.
For primary bibliographic entry see Field 5E.
W79-01328

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
Technical Report No. 48. 1978. 143 p. OWRT A-999-MD. (14).

Descriptors: Waste effluents, *Land treatment, Aerosol drift, Regulation, Monitoring instruments, *Waste water treatment, Water reuse.

The purpose of the symposium was to present results of research and case histories for systems of land treatment of waste effluents together with regulations or viewpoints of State and Federal regulatory and management agencies. Participants had the opportunity to talk with equipment and instrumentation exhibitors who were also on the program to discuss applications of different types of distribution equipment and monitoring systems. Participants represented engineers and scientists from consulting firms, manufacturing firms, municipal, county, state and federal agencies with responsibilities in research, design, planning, construction, equipment sales and service and system operators. Design criteria and the capabilities and limitation of soils to renovate water were discussed as was ecological impact. (Green -Maryland)
W79-01329

THE DEWATERING OF LIME-ALGAE SLUDGE ON SAND DRYING BEDS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
M. T. Bond, and G. F. Mitchell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 941, Price codes: A05 in paper copy, A01 in microfiche. Mississippi Water Resources Research Institute Report September 1978. 73 p, 45 fig, 2 tab, 13 ref, 2 append. OWRT A-110-MISS(1), 1434-0001-8026.

Descriptors: *Sludge treatment, *Dewatering, *Oxidation lagoons, *Algae, Sands, Filters, Waste water treatment, *Sand drying beds, *Lime-algae sludge.

Removal of algae from stabilization pond effluents is requred for the effluent to meet current federal discharge standards. Application of a thickened lime-algae sludge to sand drying beds was investigated as a treatment method. The sludge was loaded at rates of 4.0 to 16.1 gal/ft2 to sand bed columns with media depths of 6 to 12 inches. A sludge cake with an average 25% solid content was obtained within ten hours at bed depths of 6 to inches over the loadings applied, while 65 hours were required for a bed depth of 12 inches at loadings above 12 gal/ft2. Investigations indicated that dewatering rate and effluent quality were not related to media size from 0.3 to 1.5 mm. Dewatering rates decreased with increasing solids loading from about 1 to 6 lbs/ft2; however, effluent quality and sludge cake solids did not appear to be affectd by solids loading. Dewatering rates above 1 gal/ft2/hr were noted at a bed depth f 10 inches. Effluent suspended solids from the drying beds averaged 100 mg/1. Supernate withdrawal significantly decreased the dewatering time at the 12-inch bed depth; however, the supernate averaged 175 mg/1 of total suspended solids, which would require recirculation to the lagoon.
W79-01349

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF SPECIFIC VIRUSES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,
Auburn Univ., AL. Dept. of Civil Engineering.
S. R. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 044, Price codes: A05 in paper copy, A01 in microfiche. Alabama Water Resources Research Institute Auburn University, Bulletin 33, September 1978, 65 p, 18 fig, 2 tab. OWRT-B-065-ALA(1).

Descriptors: *Sand filters, Calcium, *Viruses, *Virus removal, Filters, Coliphoges, Filtration, Waste water treatment, *Volumetric analysis, *E. coli.

Calcium was shown to enhance the removal of T1 coliphage by model rapid sand filters. The concentration of calcium necessary to cause effective removal of the virus was stoichiometric with the virus titer. The effectiveness of the one-inch ID 4-inch deep model to remove T1 coliphage in the presence of calcium decrease 2+ as the sand grain size increased and as the filtration rate increased. Ca 2+ enhanced removal most effectively at

slightly acid pH's. That is, more Ca2+ is required to produce effective removal of the virus as the pH is raised. Alkametric titration curves were unreliable for determining the extent of complexation between the Ca2+ and the T1 coliphage. The titration curves indicated that the beef extract broth and the host cell Escherichia Coli also complexed with the Ca. Isolation of the virus particles would necessary for more conclusive results.
W79-01352

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
R. W. Bay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 985, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, December 1977. 108 p, 20 fig, 4 tab, 20 ref, 2 append. OWRT B-032-NEB(1), 14-34-0001-6096.

Descriptors: *Irrigation, *Biological pollution, *Water reuse, *Disinfection, *Water quality, Chlorine, Runoff, Crops, Pathogenic bacteria, On-site testing, Laboratory tests, Ammonia, Nitrogen compounds, Hydrogen ion concentration, Corn, Beans, Xanthomonas phaseoli, Corynebacterium nebraskense, Plant diseases, Blights, Bioassay, Water analysis, Sampling.

The characteristics of typical reuse irrigation water were defined with emphasis on parameters such as, ammonia nitrogen, organic matter, and pH, which can affect chlorination needed to control phytopathogenic organisms. Samples collected throughout Nebraska were tested in the field and laboratory for nitrate plus nitrite nitrogen, orthophosphate, total hardness, alkalinity, and turbidity. Samples were collected also for greenhouse bioassay to identify the phytopathogens present. The pH levels of reuse water from 6.3 to 8.6 covered a critical range affecting the disinfection efficiency of chlorine. Organic plus ammonia nitrogen was found at levels up to 10 mg/l and interfered with chlorine by reacting with chlorine to form chloramines having weak disinfection capabilities. The phytopathogenic organisms tested for chlorination sensitivity were Xanthomonas phaseoli which causes blight of dry edible beans and Corynebacterium nebraskense, which causes Goss's wilt disease of corn. Both these organisms needed only low levels of chlorine for disinfection. Below pH 8, 0.01 to 0.02 mg/l residual free chlorine produced 99% kill after 5 minutes contact. At pH 8.5, 1 to 2 mg/l were needed for the same effect. It was concluded. that chlorination of irrigated reuse water is feasible if high levels of ammonia nitrogen are not present. (Majtenyi-IPA)
W79-01358

RECOVERY AND REUSE OF PAINT SOLIDS FROM WASTE WATER,
Drew Chemical Corp., Booton, NJ. (Assignee).
T. P. Brennan.
U.S. Patent No. 4,096,061, 2 p, 7 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1121, June 20, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Separation techniques, Flocclation, Cations, Chemical reactions, Paints, Product recovery.

A latex base paint waste water containing dispersed paint solids is clarified by flocculating the paint solids with a cationic flocculant. The cationic flocculant is generally a polymer, and in particular, a polyamine or a polyvinylimidazoline. The separation paint sludge is brought to an alkaline pH and treated with an anionic dispersing agent whereby the sludge can be used in the formulation of a latex base paint. The anionic dispersant is added in an amount sufficient to neutralize the effect of the previously added cationic flocculant. (Sinha-OEIS)
W79-01391

METHOD AND DEVICE FOR SEPARATION OF SUSPENDED MATERIAL FROM A FLUID FLOW,
Paraisten Kalkki Oy, Pargas (Finland). (Assignee).
B. Myreen, and U. Nylund.
U.S. Patent No. 4,096,062, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, No. 3, p 1121, June 20, 1978.

Descriptors: *Patents, *Water purification, *Waste water treatment, *Water pollution treatment, Suspended load, Separation techniques, Sedimentation, Filtration, Flow rates, Flow separation, Equipment.

Suspended solid particles are separated from a fluid flow (or water) by dividing the flow into partial fluid flows in flow channels having an upper filter surface travelling upstreams and a lower filer surface travelling downstreams, controlling the flow velocity in the channels such that the flow is turbulent but at the same time low enough to allow for sedimentation of the suspended material to form a clear top layer off so that more than half of the liquid fed to the channel is filtered through the upper filter surface, suctioning less than half of the liquid fed into the channel through a sediment formed on the lower filter surface, and finally removing the sediment from the lower surface. (Sinha-OEIS)
W79-01392

WATER STERILIZATION APPARATUS,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (Germany, F.R.).
For primary bibliographic entry see Field 5F.
W79-01395

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 4,097,376, 9 p, 12 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Bleaching wastes, Separation techniques, Filtration, Absorption, Color, Cellulose, Pulp and paper industry, Water reuse.

A process for the purification of industrial effluents, especially for the decolorization of waste liquors arising in the textile, paper and leather industry, is characterized in that the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. Preferably filters of cellulose itself or of waste sheets from printing are used. Suitable precipitants are water-soluble basic aminoplasts such as formaldehyde-dicyandiamide condensation products. (Sinha-OEIS)
W79-01396

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM SALT,
Shikoku Paper Mfg. Co., Ltd., (Japan). (Assignee).
B. Ayukawa.
U.S. Patent No. 4,097,377, 11 p, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, Coagulation, Chemical precipitation, Separation techniques, Color, Pulp and paper industry, *Zirconium salts treatment.

A method for purification of water in which soluble octavalent polymer cation forming water soluble zirconium salts are used to coagulate and precipitate suspended substances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic substances in waste water is described. Suspended substances and colloidal dispersed particles are removed as well as non-colloidal dissolved low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS)
W79-01397

MULTIPLE EFFECT EVAPORATION OF WATER FROM WATER CONTAINING COMBUSTIBLE SLUDGES,
For primary bibliographic entry see Field 5E.
W79-01398

SEPTIC TANK-LEACHING POOL ARRANGEMENT,
Scotto (Anthony J.), Smithtown, NY. (Assignee).
K. Carlson.
U.S. Patent No. 4,097,380, 6 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1559, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Septic tanks, Domestic wastes, Leaching, Subsurface drainage, Equipment.

The septic tank is provided with a cylindrical portion made of precast concrete which has a support ring for mounting the septic tank on the upper wall edge of a leaching pool. The cylindrical portion defines a chamber for the storage of the raw sewage and in which the sewage is acted upon in a conventional anaerobic reaction, and which has an inlet baffle, and an outlet baffle positioned diametrically opposite to the inlet baffle to allow for the maximum flow path between them. The septic tank extends downwardly into a cistern or leaching pool and defines an annular space. The septic tank and support have respective outlet openings for the flow of liquid from the tank into the cistern. (Sinha-OEIS)
W79-01399

METHOD OF TREATING WASTE WATER WITH ACTIVATED SLUDGE,
Idemitsu Kosan Co. Ltd., Tokyo (Japan). (Assignee).
Y. Kobayashi, M. Iwata, S. Yoshida, and H. Akatsuka.
U.S. Patent No. 4, 098,689, 7 p 4 fig, 6 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 972, No 1, p 254, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Activated sludge, Aeration, Sea water, Biochemical oxygen demand.

Sea water is fed to waste water in operating an activated sludge process. Sea water can be added before or after the waste water is introduced into the aeration tank. The sea water can be fed continuously during operation or intermittently depending upon the total salt concentration of the waste water. Treatment is carried out as long as salt concentration ranges from 0.3 to 0.5 weigh percent. Feeding of sea water is stopped or decreased when the removal rate of BOD in the treated water begins to fall. (Sinha - OEIRS)
W79-01403

WATER PURIFICATION PROCESS,
Illinois Univ. Foundation at Urbana-Champaign. (Assignee).
M. J. Semmens.
U.S. Patent No. 4,098,690, 7 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 254, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, *Ion exchange, Separation techniques, Ammonia, Nitrogen fixing bacteria, Ion exchangers, Regeneration.

The invention relates to the removal of ammonia from water by ion exchange and the regeneration of the ammonia containing ion exchange material by use of nitrifying bacteria. Wastewater containing ammonia is first passed through an ion ex-

change unit which has a preferential affinity for ammonium ions. The spent ion exchanger is taken out of service for regeneration. Regeneration may be accomplished in either of two ways. The ion exchanger may be contacted with a brine containing a high concentration of nitrifying in which technique, exchange and nitrification occur simultaneously. Or the ion exchanger may be exposed to the brine only, and the resultant ammonia containing brine is then nitrified in a separate unit before being recycled. (Sinha-OEIS)
W79-01404

PURIFICATION OF WATER FOR BOILER,
Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 5F.
W79-01405

CATIONIC CHLORINE-RESISTANT POLYMERIC FLOCCULANTS AND THEIR USE,
Betz Labs., Inc., Trevose, PA. (Assignee).
R. G. Tonkyn, and N. Vorchheimer.
U.S. Patent No. 4,098,693, 4 p, 3 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 255, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Flocculation, Chemical reactions, Organic compounds, Polymers.

Cationic, chlorine-resistant polymeric materials, useful as flocculants, are prepared by reacting an epihalohydrin with a mixture consisting of a lower di-alkylamine and ammonia, where the ammonia level is from about 15% to about 33% of the total molar amount of the ammonia-amine combination, and the ratio of the epihalohydrin to the combination is at least 0.9. The flocculants of this invention are effective in clarifying aqueous systems containing undesirable particulate matter, and are compatible with the conventional flocculating agents, such as alum, clay, and iron salts. They are chlorine-resistant since substantially all of the nitrogen atoms in the polymer are quaternized. The polymer itself is cationic, with one positive charge per nitrogen group, and is in electrical balance with the equal number of halogen anions present. (Sinha-OEIS
W79-01406

METHODS AND COMPOSITIONS FOR DISPERSING OIL FILMS,
United States Steel Corp., Pittsburgh, PA. (Assignee).
For primary bibliographic entry see Field 5G.
W79-01407

APPARATUS FOR REMOVING MERCURY FROM WASTE WATER,
Sobin Chlor-Alkali, Inc., Orrington, ME. (Assignee).
P. DeAngelis, A. R. Morris, and A. L. MacMillan.
U.S. Patent No. 4,098,697, 6 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 256, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, mercury, Filtration, Coals, Filters, Anthracite coal, Regeneration, *Mercury recovery.

A method for removing mercury from water contaminated with mercury comprises contacting the water with finely divided anthracite coal. The mercury laden water can first be treated with sodium borohydride to reduce dissolved mercury to the metallic form. The water treated with reducing agent, is filtered through a pressure leaf filter coated with a filter aid, contacted with anthracite coal and contacted with chelating resin. It has been discovered that finely divided anthracite coal is not merely the equivalent of other filtering agents but actually removes finely divided metallic mercury from contaminated water even when water has been previously filtered using conventional filtration techniques. The finely divided anthracite coal can be regenerated by simply distilling the mercury by heating the anthracite or dissolving out the mercury with chlorine containing water or hydrochloric acid. (Sinha-OEIS)
W79-01408

LOW TURBULENCE SETTLING TANK,
Magna International Inc., Downsview (Ontario). (Assignee).
D. J. Harding.
U.S. Patent No. 4,098,699, 12 p, 10 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 257, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Suspended solids, Sedimentation, Separation techniques, Settling basins, Water reuse, Equipment, Tar sands extraction process.

The settling tank of this invention is particularly useful for separating fine silt and clay from the watery effluent which is produced by a tar sands extraction process. By the use of a continuous process, it is possible to dispose of the solids through a system of re-inserting the solids into the extracted tar sands where they can be returned to the excavation site. Continuous operation of the separation process also makes possible recycling the water from extraction discharge back into the extraction step. The specification discloses a settling tank system adapted for low-turbulence settling of solids from water comprising a circular tank for retention of water during settling and a radial boom provided at the level of the surface of water for rotation around a central hub. A uniform and non-turbulent supply of solids-containing water and a non-turbulent removal of cleared water is at a equal rate. (Sinha-OEIS)
W79-01409

METHOD OF TREATMENT OF AN OXIDIZABLE MATERIAL BY A BIOCHEMICAL PROCESS,
Societe Anonyme Pour L'Etude et L'Exploitation des Procedes Georges Claude, Paris (France). (Assignee).
P. Boulenger, N. Angelier, and J. P. Torres.
U.S. Patent No. 4,100,062, 35 p, 24 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 714, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Industrial wastes, Water purification, *Biological treatment, Oxygen, Oxygenation, Gases, Bubbles, Mixing, Equipment.

A method of biochemical treatment which finds particular application to the biological processing of waste or sewage water takes place in an oxygenation zone and comprises the following operations: In a first step an oxygenation gas consisting of more than 50% by volume of oxygen, is supplied into the water in the form of bubbles. In a second step the gaseous atmosphere is placed in contact with the water by the use of mechanical means. These steps are repeated as long as the mean rate of flow of oxygenation gas to the oxygenation zone corresponds substantially to the consumption of oxygen. (Sinha-OEIS)
W79-01412

METHOD AND APPARATUS FOR THE BIOLOGICAL CLEANSING OF WASTE WATER,
Maschinenfabrik Hellmut Geiger, Karlsruhe (West Germany). (Assignee).
L. Hartmann.
U.S. Patent No. 4,100,063, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, *Biological treatment, Filtration, Aeration, Filters, Trickling filters.

The invention provides an improved method and apparatus for a percolating-type waste water filter in which the operation of the filter can be controlled and in which, in a relatively small space, a large quantity of waste water can be processed. The percolating-type filter is charged with waste water and air and the biological mass is mechanically removed from the growing surface before it can loosen itself biologically and/or physically. This is advantageous since the biological mass is densified and the conventional sedimentation step can be completely or at least partially spared. (Sinha-OEIS)
W79-01413

METHOD FOR REMOVING OF MULTIVALENT HEAVY METALS FROM METAL PLATING WASTE EFFLUENTS,
Purdue Research Foundation, Lafayette, IN. (Assignee).
J. E. Etzel.
U.S. Patent No. 4,100,065, 6 p, 6 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution treatment, Separation techniques, *Ion exchange, *Heavy metals, *Cation exchange, Recycling, Expoliated vermiculite, *Metal plating wastes.

An exfoliated vermiculite cation-exchange column is used to remove multivalent heavy metals (copper, zinc, nickel, chromium, etc) from metal plating wastes. The exfoliated vermiculite may be either chemically or relatively low-temperature thermally expanded vermiculite ore. It preferably has a cation-exchange capacity of over 80 meq/100g. Exfoliated vermiculite particle sizes of less than approximately 10 mesh are preferred as the column packing. The ion-depleted vermiculite from the exchange column after use can be further expanded thermally and used as a lightweight filling material. (Sinha-OEIS)
W79-01415

TREATING PAINT WASTE SOLIDS,
Carrier Drysys Ltd., London (England). (Assignee).
I. Bloomer, and R. W. Young.
U.S. Patent No. 4,100,066, 11 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715-716, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Separation techniques, Scum, *Paints(Wastes), Equipment, Flotation.

A method and apparatus of collecting and disposing of waste paint solids contained in an aqueous medium which flows from a paint spraying booth into a container located beneath the booth or contained in scum on the surface of aqueous medium delivered from the water container into a flotation tank outside the booth comprises the steps of: flowing paint laden aqueous medium from the water container or scum into the lower portion of a vessel located outside the booth; retaining the aqueous medium in the vessel for a residence time sufficient to permit paint solids to accumulate as a raft on the surface of the water in the vessel; and causing the accumulated paint solids to flow from an outlet at the upper portion of the vessel into a container by applying fluid pressure to the raft. (Sinha-OEIS)
W79-01416

APPARATUS FOR USE IN WATER PURIFICATION PARTICULARLY SEWAGE TREATMENTS,
Filters International, Inc., Chicago, IL. (Assignee).
E. B. White, and M. N. Sharma.
U.S. Patent No. 4,100,070, 25 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 717, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Flocculation, Biological treatment, Filtration, Adsorption, Chemical precipitation, Chemicals.

An apparatus for treatment of sewage and waste materials is particularly desirable for relatively small installations and utilizes high rate biochemical oxidation/physio-chemical adsorption, in which the sewage is subjected to a primary biological treatment, and a secondary settling treatment. The primary-seconary effluent, following addition of an organic-inorganic chemical material comprising prereacted floc, a phosphate precipitating material and a nonionic polyelectrolyte, operative to maintain pH and zeta potential favorable to flocculation, is subjected to a tertiary treatment by passage through a mixed filtration and adsorption bed containing activated carbon. The mixed bed is periodically regenerated by a partial wet-gas oxygenation cycle, utilizing a reflex operation in which the products of regeneration are returned to the primary treatment. The chemicals are produced as a dry honogeneous discrete material which may be readily transported and handled in dry form, and formed into an aqueous mix or slurry at time of ultimate use. (Sinha-OEIS)
W79-01418

WASTE-WATER TREATMENT SYSTEM,
F. J. Hofcroft.
U.S. Patent No. 4,100,073, 4 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 718, July 11, 1978.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, *Domestic wastes, Septic tanks, Anaerobic conditions, Filters, Disinfection, Environmental sanitation.

A wastewater treatment system is provided for use in treating the sanitary and grey waste waters from individual homes in areas where subsurface disposal of these wastes is not feasible and where discharge of treated effluent to a body of surface water is permitted. All toilet wastes, bath and shower wastes, and kitchen wastewater can be treated by this process and system. These wastes are cleansed, disinfected and clarified prior to discharge to the receiving body of water. The system includes a septic tank, a dosing chamber, an enclosed sand filter, and a disinfection unit operatively connected to one another for progressive cleansing, clarification and disinfection of the wastewater. (Sinha-OEIS)
W79-01420

WASTEWATER RECYCLING ON FOREST LANDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper.
Pennsylvania Institute for Research on Land and Water Resources Reprint Series No. 39 (reprinted from Forest Soils and Forest Land Management, Proceedings 4th N.A. Forest Soils Conf., Laval University, Quebec, Aug. 1973) 16 p, 7 tab, 9 ref. OWRT B-047-PA(4), 14-31-0001-3639.

Descriptors: *Water reuse, Sewage disposal, Sewage treatment, Sludge disposal, Sludge treatment, Treatment facilities, Wastewater disposal, Wastewater treatment, Water conservation, Municipal wastes, Agronomy, Forests, Golf courses, Recycling, *Living filter system, *Revegetate bituminous spoil banks, Renovation, Agricultural land, Forest preserves.

Ten years of research have indicated that the living-filter system for renovation and conservation of municipal wastewater is feasible and that combinations of agronomic and forested areas provide the greatest flexibility in operation. Such a system is more adaptable to small cities and suburbs than to large metropolitan areas because of the availability of open land close to the wastewater treatment plant, although the land area requirement is not a major prohibitive factor. At an application rate of 5 cm per week, only 52 ha of land would be required to dispose of 4 million liters of wastewater per day. Although large contiguous blocks of agricultural and natural forest land would be the most desirable for efficiency and economy, major metropolitan areas could utilize golf courses, playing fields, forest preserves and parks, greenbelts, scenic parkways, and perhaps even divided highway and beltway medial strips. Results also indicate that municipal wastewaters might be used to reclaim and revegetate many of the barren bituminous strip-mined spoil banks existing throughout the Appalachian region and restore them to a more esthetic and productive state. (Sink-Penn State)
W79-01424

SYNTHESIS OF OPTIMAL FEEDBACK CONTROL SYSTEMS FOR FERMENTATIONS AND BIOLOGICAL WASTE TREATMENT PROCESSES,
Kansas State Univ., Manhatten. Dept. of Chemical Engineering.
L. T. Fan, P. S. Shah, and L. E. Erickson.
In: Proceedings, Fourth International Fermentation Symposium: Fermentation Technology Today. p 1167-177, 1972, 7 fig, 53 ref. Kansas Water Resources Research Institute Contribution No. 89. OWRT A-045-KAN(6), 14-31-0001-3516.

Descriptors: Dynamics, Proportional control, *Fermentation, *Waste water treatment, Waste treatment, *Control, *Optimal feedback control, *Biological treatment.

The control of growth processes in fermentations and biological waste treatment systems was examined using optimal feedback control theory. The objectives of control actions were to maintan the desired productivity in a chemostat and to sustain uniform effluent quality in a biological waste treatment process. It was assumed that the content of the aeration vessel was completely mixed in both cases. The Monod model was employed to represent growth in the chemostat; however, an endogenous metabolism term was added for biological waste treatment. Uses of proportional control and proportional plus integral control were considered for the biological waste treatment process. The results showed that optimal feedback control can significantly reduce the time required for the process to return to the desired state following a disturbance.
W79-01428

POLLUTION ABATEMENT FACILITIES AT NATIONAL FISH HATCHERIES,
Fish and Wildlife Service, Portland, OR.
For primary bibliographic entry see Field 5G.
W79-01463

EVALUATION OF CLINOPTILOLITE FOR AMMONIA REMOVAL,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
W. G. Williams.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974, p 94-100, 2 tab, 2 fig.

Descriptors: *Ammonia, *Nutrients, Nitrogen, Nitrogen compounds, Methodology, *Aquiculture, *Fish hatchery, Oxygen, Biological oxygen demand, Fish physiology, Clinoptilolite, Ammonia Removal, Ammonia production, Fish handling facilities, Waste water treatment, Waste removal.

A system was designed that utilizes a high rate sand filter for removal of suspended organic solids, followed by an ion-exchange bed for the removal of ammonia. The ion-exchange material selected was 'clinoptilolite' a zeolite material that exchanges sodium ion for ammonia. The results of tests with this system designed for waste removal in a fish hatchery are given. (EIS-Katz)
W79-01464

5E. Ultimate Disposal Of Wastes

ADDITION OF POTATO PROTEIN RECOVERED FROM POTATO STARCH FACTORY WASTE EFFLUENTS FOR BREAD,
T. Fukui.
Nippon Shokuhin Kogyu Gakkai-Shi, Vol. 25, No. 1, p 43-46, 1978. 6 fig, 2 tab, 4 ref.

Descriptors: *Proteins, *Potatoes, *Nutrient removal, *Reverse osmosis, *Recycling, *Industrial wastes, Food processing industry, Ultimate disposa, Waste water treatment, Waste water disposal.

Protein recovered from potato starch manufacturing effluents by reverse osmosis was evaluated as an additive for commercial bread baking. Data on the taste, flavor, specific volume, grain, and softness of breads containing various concentrations of potato protein flour was analyzed by factor analysis using an orthogonal L(16) design with four factors, taken two or three at a time. Analysis of variance indicated that the optimum ratio for breadmaking in terms of the finished product would be 2-6 parts of potato protein flour to 100 parts of wheat flour. (Schulz-FIRL)
W79-01073

SEWAGE FROM THE YEAST INDUSTRY: ITS NATURE AND ITS PURIFICATION (ABWASSER DER HEFEINDUSTRIE, BESCHAFFENHEIT UND REINIGUNG),
For primary bibliographic entry see Field 5D.
W79-01075

WATER CONTENT REDUCTION OF METAL-PLATING WASTE SLUDGE BY A PRESS AND CENTRIFUGE (MEKKI SURAJI NO KOKAI-TEKI DASSUI NI KANSURU KISOTEKI KENKYU),
E. Oi.
Kogai, Vol. 13, No. 4, p 9-14, 1978. 6 fig, 2 tab, 8 ref.

Descriptors: *Dewatering, *Centrifugation, *Sludge treatment, *Filters, *Industrial wastes, Metals, Clays, Separation techniques, Pressure, Compaction.

A press and a centrifuge were tested for their abilities to dewater metal plating waste sludges containing colloidal metal hydroxides. The centrifuge was operated at 120, 400, and 1100 G's over 0-30 min; the press was operated at pressures of 1-40 kg/sq m. The press was cited as more efficient than the centrifuge; the final water content of the sludge was related in a power formula to the initial water content and the applied pressure. Limits imposed by plasticity on the water of aluminum hydroxide and nickel hydroxide sludges were 2.14 and 1.40, respectively. (Schulz-FIRL)
W79-01082

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-01090

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01108

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5B.
W79-01113

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Soil Science Society of America Journal, Vol. 40, No. 5, p 715-719, Sept.-Oct. 1976. 6 fig, 4 tab, 10 ref. (California Water Resources Center Project

UCAL-WRC-W-420).

Descriptors: *Sludge disposal, *Sludge, *Cadmium, *Heavy metals, *Rice, Waste disposal, Soil treatments.

Rice plants (Oryza sativa var. 'Colusa') were grown to maturity in pots containing a soil amended with 1% sewage sludge enriched with variable amounts of CdSO4 ranging up to 640 microgram Cd/g). Two sets of soil cultures were used; one for rice under continuous flood and the other under nonflood conditions. Grain production for rice under flood management was relatively unaffected by the Cd treatment. 25% yield decrement was associated with a treatment of 320 microgram Cd/g. Under nonflood management, however, a comparable decrement in grain production was observed with a treatment of only 17 microgram Cd/g. The Cd content of mature leaves at early flowering varied from approximately 0.3 microgram Cd/g for the controls to 2.8 microgram Cd/g for plants receiving the highest Cd treatments. Leaf Cd values were slightly higher under the nonflood culture. The Cd content of the grain under nonflood management was approximately 55% greater than that of grain under flood management. The Cd content of mature leaves correlated with grain production for rice produced under either flood or nonflood culture. Chemical analysis of saturation extracts revealed greatly reduced Cd concentrations in soil solutions under flood management which may account for the greater tolerance of the cultivar to soil Cd under flood culture. This reduced availability of Cd in flooded soils is attributed to precipitation of CdS. (Snyder-Calif, Davis)
W79-01127

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W79-01135

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
For primary bibliographic entry see Field 5G.
W79-01144

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
For primary bibliographic entry see Field 5G.
W79-01154

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME II: MATERIALS AND METHODS/RESULTS AND DISCUSSION,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W79-01201

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5C.
W79-01202

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5B.
W79-01208

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01236

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01237

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
For primary bibliographic entry see Field 5B.
W79-01250

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01282

EFFECT OF BEEF-FEEDLOT-LAGOON WATER ON SOIL CHEMICAL PROPERTIES AND GROWTH AND COMPOSITION OF CORN FORAGE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-01290

AN ASSESSMENT OF TECHNOLOGY FOR POSSIBLE UTILIZATION OF BAYER PROCESS MUDS,
Battelle Memorial Inst., Columbus, OH.
For primary bibliographic entry see Field 5D.
W79-01315

AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5D.
W79-01316

TREATMENT AND DISPOSAL OF COMPLEX INDUSTRIAL WASTES,
Reichhold Chemicals, Inc., Tuscaloosa, AL.
For primary bibliographic entry see Field 5D.
W79-01321

FEASIBILITY STUDY, FLY ASH RECLAMATION OF SURFACE MINES, HILLMAN STATE PARK, FEASIBILITY STUDY,
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W79-01323

ECONOMIC ANALYSIS OF ALTERNATIVE SLUDGE DISPOSAL METHODS IN VERMONT,
Vermont Univ., Burlington. Dept. of Economics.
R. G. Fritz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 920, Price codes: A06 in paper copy, A01 in microfiche. Vermont Water Resources Research Center, Technical Completion Report. June 30, 1978. 99 p, 4 fig, 7 tab, 19 ref. OWRT A-031-VT(1), 14-34-0001-7096.

Descriptors: Sludge, *Sludge disposal, *Land disposal of sludge, Wastewater sludge, Organic fertilizers, Sludge burial, Costs of disposal, Small communities, Regional cooperation, Sludge treatment and processing, Economic analysis, *Waste disposal, *Alternative planning.

Information is provided on the costs of municipal sewage sludge disposal in Vermont. Specific objectives were to determine the costs of two methods of disposal, landfill and landspreading; determine factors which influenced disposal costs; determine the economic benefits of landspreading disposal; and designing a regional plan for sludge disposal. The data were obtained by use of three survey questionnaires. The first, used in interviews with operators of twenty wastewater treatment plants, gathered information on sludge disposal practices and the costs associated with these practices. Two additional questionnaires were used to survey current and potential users of sludge to provide information concerning landspreading practices and costs. There was no indication that either method of disposal, was less expensive than the other. An analysis of variance indicated, however, that per capita disposal costs associated with the use of flotation thickeners and vacuum filters were significantly higher than those associated with liquid and sand drying bed dewatered sludge disposal. Total costs of liquid sludge disposal were much more responsive to changes in distances to disposal sites than were total costs associated with dewatered sludge disposal. Other factors, especially weather, were often more important than economic considerations in choosing a disposal method. The nutrient value of sludge when used as a fertilizer supplement was $34.60 per ton in 1976. The sale of sludge has potential for communities to recover portions of sludge disposal costs. An initial evaluation of regional efforts to manage and dispose of sludge was carried out. Evidence indicates that increased regional efforts may reduce disposal costs and facilitate increased landspreading. One specific regional approach was put forward.
W79-01328

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W79-01329

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W79-01350

MULTIPLE EFFECT EVAPORATION OF WATER FROM WATER CONTAINING COMBUSTIBLE SLUDGES,
J. C. St. Clair.
U.S. Patent No. 4,097,378, 6 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Sludge treatment, *Sludge disposa, *Waste disposa, *Separation techniques, Evaporation, Condensation, Solid wastes, Equipment, Energy conservaton.

The object of this invention is to provide a low cost method for removing water from peat, garbage, sewage sludges and other combustible water containing sludges in low cost equipment so they can be burnt, thermally decomposed or hydrogenated to valuable materials. Water containing combustible sludges are dried with the multiple effect use of the heat required by adding recycled cool high boiling oil and heating the mixture by direct contact with steam produced as later described.

Then the oil sludge mixture has water separated off which is possible, since water has been added by the direct condensation of steam in the heating of the mixture plus any extra original water in the sludge that can be removed by a centrifuge. The mixture is heated again by adding hot oil and then the mixture has water evaporated off by reducing the pressure. This steam produced is used for the direct steam heating mentioned above. Then water vapor is evaporated off again by reducing the pressure again and this water vapor is condensed by a water cooled condenser. In this way water vapor is evaporated off with he double use of heat. (Sinha-OEIS)
W79-01398

TREATING PAINT WASTE SOLIDS,
Carrier Drysys Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5D.
W79-01416

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-01421

WASTEWATER RECYCLING ON FOREST LANDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W79-01424

5F. Water Treatment and Quality Alteration

REMOVAL OF METALLIC IMPURITIES FROM WATER BY ELECTROCHEMICAL METHODS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01121

INJURIOUS EFFECT OF TAP WATER ON ROOTING OF CUTTINGS OF BRYOPHYLLUM CALYCINUM,
Rockefeller Univ., New York.
For primary bibliographic entry see Field 5C.
W79-01221

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 402, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-430/9-74-007, 1975. 166 p, 28 fig, 8 tab, 40 ref, 4 append.

Descriptors: *Water supply, *Water consumption(except consumptive use), *Water distribution(Applied), Manuals, Groundwater, Water sources, Water wells, Surface runoff, Surface waters, Surface water availability, Rural areas, Water storage, Water quality, Pumping, Bacteria, Disinfection, Legislation.

Guidelines for planning an individual water supply system are provided in this manual which is a revision of PHS Publication No. 24, Individual Water Supply Systems, published in 1962. The contents are divided into five parts: selection of a water source; groundwater; surface water for rural use; water treatment; and pumping, distribution, and storage. Information is provided for determining the quality and quantity of water needed for various uses. The characteristics of groundwater are discussed, followed by details on constructing wells, such as types of wells, ground preparation, testing procedures and sanitary considerations. Principal sources of surface water considered include controlled catchments, ponds or lakes, surface streams and irrigation canals. Information on natural and manmade water treatment processes such as sedimentation, coagulation-flocculation, filtration, and conditioning is presented. Equipment used in pumping, distribution and storage is examined. The appendices provide: a recommended procedure for cement grouting of wells for sanitary protection, steps for determining bacteriological quality of a water supply, methods of emergency disinfection, and suggested legislation for water well construction and pump installation. (Gibson-IPA)
W79-01311

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 320, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA - 430/9-73-018, December 1973. 52 p, 2 fig, 9 tab, 6 ref, 4 append.

Descriptors: *Water supply, *Potable water, *Drinking water, *Water quality, Interstate, Highways, Safety, Sampling, Surveys, Laboratory tests, Facilities, Water quality control.

Results of a study of 119 water supply systems serving the traveling public along Interstate Highways in Virginia, Oregon and Kansas are presented. The two main categories of water supply systems studied were safety rest areas owned and operated by the respective State Highway Departments and commercial service facilities such as restaurants, service stations and motels. Each water supply system was investigated on the basis of drinking water quality, adequacy of facilities and their operation, and adequacy of the surveillance program. The findings of the study indicate that 63 percent (75) of the water systems surveyed delivered water which failed to meet one or more constituent limits of the U.S. Public Health Service Drinking Water Standards, 19 percent (22) of the systems failed to meet at least one mandatory limit, and 15 percent (18) were contaminated with coliform bacteria. The evaluation criteria, procedures used in the field study, sampling program and laboratory study are detailed recommendations are presented. (Gibson-IPA)
W79-01312

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
J. E. Warren.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 445, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-430/9-74-009, 1974. 59 p, 13 ref, 3 append.

Descriptors: *Water supply, *Potable water, *Water supply development, *Evaluation, Management, Water management(Applied), Water quality, Water quality control, Surveys, State governments, Standards, Public health, Regulation, Project planning.

Guidelines are supplied for conducting evaluations of state drinking water supply programs and developing new programs to effectively regulate and insure a healthful and safe supply of drinking water to the public. Methods of identifying programs deficiencies are described and criteria by which corrective measures can be developed are proposed. Three major spheres or divisions of authority under which a state water supply program normally operates are discussed, and cover: legal statutes, administrative rules and regulations, and water supply program policy. Suggestions are given for appropriate state water supply program activities and resources (both manpower and monetary). Also included under guidelines for evaluation of a state's drinking water supplies are: criteria for selecting a representative number of public water supplies for study; current assessment of water supply systems based on a field survey of existing conditions and examination of data in official files; and important sanitary features of a water supply system and their health significance. (Majtenyi-IPA)
W79-01313

CHARACTERISTICS OF SMALL MAMMAL POPULATIONS IN FORESTED AND OLD FIELD HABITATS PRIOR TO EFFLUENT SPRAY IRRIGATION,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5C.
W79-01331

FLUORIDE REMOVAL FROM POTABLE WATER SUPPLIES,
Illinois State Water Survey, Urbana.
F. W. Sallo, Jr., E. Larson, and H. F. Mueller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 969, Price codes: A03 in paper copy, A01 in microfiche. University of Illinois Water Resources Center Research Report No. 136, September, 1978. 20 p 3 fig, 5 tab, 2 ref. A-094-ILL(1).

Descriptors: *Fluorides, *Coagulation, *Flocculation, Magnesium hydroxide, Water softening, Adsorption, Activated carbon, *Water treatment, Alum, *Fluorapatite, Coagulant aid.

The objective was to determine whether or not the fluoride level in waters with moderate fluoride content (2 to 10 mg/1) could be reduced to acceptable levels by chemical treatment. The optimum concentration for dental health is from 1.1 to 1.8 mg/1. A variety of methods for the removal of fluoride have been reported in the literature. Methods which appeared to have some possibility of success were compiled. Coagulation with alum at pH levels of 6.2 to 6.4 was one of the more effective methods tested. Fluoride was found to be adsorbed by magnesium hydroxide. This occurs in the softening process with magnesium-containing waters, and could be increased by adding both magnesium salts and lime. The formation of fluorapatite by the reaction of fluoride with phosphoric acid and lime was very effective for the removal of fluoride. Flocculation with iron salts was of little benefit in the removal of fluoride. The fluoride removed was from 2 to 10 percent of the initial concentration. Activated charcoal was tested without any appreciable success. Polyelectrolytes, in general, did not remove fluoride, but were very helpful in obtaining good clarification from some processes and thereby aided in fluoride removal.
W79-01351

SYSTEM FOR REMOVAL OF TOXIC HEAVY METALS FROM DRINKING WATER,
Ameron, Inc., South Gate, CA. (Assignee).
E. R. du Fresne.
U.S. Patent No. 4.096,064, 9 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1121-1122, June 20, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water pollution, Water pollution treatment, Water quality control, Heavy metals, Electrochemistry, Ion transport, Equipment, 'Half-length' concept.

Toxic heavy metal ions are removed from water by electrochemical replacement as the water flows through a tandem bed of (1) activated zinc and the (2) magnesium alloyed with a minor amount of manganese to inhibit corrosion. The zinc is activated by contact with a noble metal salt. Preferably, fine granules of zinc and Mg/Mn are used. Clogging is prevented by intermittent vacuum degassing of the beds. The activated zinc and the Mg/Mn advantageously are prepackaged and stored in cartridges which become part of the processing column. The Mg/Mn cartridge has a non-reactive atmosphere of e.g., argon, retained by frangible or soluble barriers that hermetically seal the ends of

the cartridge. The barriers are torn away or dissolved by the initial water flow when the cartridge is installed. System scale-up is simplified by a 'half-length' concept characteristic of the present invention. Specifically, the heavy metal ion concentration is reduced by one-half for each additional fixed distance ('half-length') traversed through the reactant bed. (Sinha-OEIS)
W79-01393

WATER STERILIZATION APPARATUS,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (Germany, F.R.).
W. Fischer.
U.S. Patent No. 4,097,355, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1552, June 27, 1978.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Electrolysis, Electrodes, Conductivity, Oxidation, Water properties, Electrical properties, Equipment.

The electrodes of a water purifcation cell are immersed in the water to be sterilized. The current through the cell is kept constant by varying the resistance of an emitter-collector circuit of a transistor connected in series with the cell to compensate for changes in the cell's internal resistance. The voltage across the cell is monitored by two threshold circuits to determine if the conductivity of the water is within an allowable conductivity range. If the conductivity falls outside the range, a light-emitting diode is energized. The light-emitting diode is also energized if the voltage of the battery supplying the power for the cell falls below a given value. If no water is present in the supply line to the cell, a switching transistor is blocked, thereby disconnecting most of the equipment from one side of the battery. (Sinha-OEIS)
W79-01395

ALGAECIDAL COMPOSITION,
Applied Biochemists, Inc., Mequon, WI. (Assignee).
D. E. Seymour, J. C. Schmidt, and D. A. Bezella.
U. S. Patent No. 4,098,602, 4 p, 7 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 231, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Algae, *Algaecides.

An algaecidal composition is comprised of the combination of an ammonium quaternary compound and a copper complex formed by reacting a copper compound with a complexing material, such as an alkanolamine, a tertiary amine, a diamine, ammonium hydroxide, or a polyethylene glycol. The algaecidal composition has extended stability and shelf-life and possesses improved algaecidal effectiveness. (Sinha-OEIS)
W79-01401

METHOD OF PURIFYING WATER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
V. Eibl, and A. Ries.
U.S. Patent No. 4,098,660, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 246, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Microorganisms, Oxidation, Anodes, Flow rate, Equipment.

The invention relates to improvements in a method of purifying water contaminated with microorganisms and having a specific resistance. The method is performed in an electrolytic cell including a silver-containing anode, and the water to be purified flows substantially parallel to the anode surface. The anode may be made of a material containing metallic silver or of substantially pure (99%) silver. It has been found that it is necessary to confine the stream of water in a flow section of 1 to 4 mm from the anode in order to subject all the water simultaneously to anodic oxidation and to enrichment with silver ions. Anodic oxidation of microorganisms requires the generating of active oxygen at the anode to oxidize organic matter in the adjacent water. When anodic oxidation is combined with silver ion enrichment, the dwell time of the water in the electrolytic cell can be reduced to commercially useful periods and still achieve complete sterilization. (Sinha-OEIS)
W79-01402

PURIFICATION OF WATER FOR BOILER,
Department of Energy, Mines and Resources, Ottawa (Ontario).
J. Filby.
U. S. Patent No. 4, 098,691, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 255, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Industrial water, Water softening, Organic matter, Ozone, Degradation(Decomposition), Oxidation, Boiler feed water, Resins, *Regeneration.

Ozone is dispersed in river water to be purified and used in a high pressure boiler. Raw water containing silicious contaminants and high molecular weight water-soluble organic molecules is contacted with ozone, before the water is contacted with the strongly-basic anion attracting resin. The ozone is dispersed in the water in sufficient quantity as to degrade larger organic molecules, with the result that the resin may satisfactorly be regenerated in conventional manner by contacting it with sodium hydroxide. Preferably the ozone is provided in an amount less than 2 parts per million by weight/per part per million by weight carbon present in the water as total organic carbon. The invention is characterized by several advantages: the ozone is selective in degrading the large organic molecules are significantly less intense in their resin-fouling properties, thereby making it possible to use the resins longer before regeneration is needed; and because ozone is a powerful oxidizing agent, the need for chlorine pretreatment is reduced or eliminated. (Sinha-OEIS)
W79-01405

PURIFICATION OF WATER BY REVERSE OSMOSIS USING A SUPPORTED SEMI-PERMEABLE MEMBRANE,
United Kingdom Atomic Energy Authority, London (England), (Assignee).
G. M. Gale.
U.S. Patent No. 4,100,064, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 972, no 2, p 715, July 11, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Reverse osmosis, Membrane processes, *Semi-permeable membranes, Polyvinyl chloride(pvc).

This invention relates to porous plastic materials, and in particular to porous rigid polyvinyl chloride (pvc). A method of making porous rigid pvc comprises extruding or moulding a stabilized rigid pvc mix containing from 0.5% to 3.0%, by weight on the weight of the pvc, of a chemical blowing agent. Tubes for use in water purification by reverse osmosis preferbly have a least 1 hole/ sq mm, e. g. from 1 to 10 holes/sq mm of outside surface area. The tubes are intended to have the semi-permeable membrane applied to the smooth outer surface and to have impure water in contact with this treated outer surface that purified water is recovered from the bores of the tubes.
W79-01414

5G. Water Quality Control

NITROGEN AND IRRIGATION MANAGEMENT TO REDUCE RETURN-FLOW POLLUTION IN THE COLUMBIA BASIN,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
B. L. McNeal, and B. L. Carlile.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 328, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. 600/2-76-158, September, 1976.

Descriptors: *Nitrogen, Leaching, Crop production, Potatoes, Washington, *Colorado river, Nutrients, Fertilizers, Fertilization, Nitrification, Sprinkler irrigation, Irrigation, *Irrigation systems, Furrow irrigation, Sampling, *Return flow.

Cooperative field studies have evaluated dissolved-N levels and leaching, and corresponding crop yields, for potato production practices in the Columbia Basin area of Washington. High dissolved-N levels (with resultant high potential for return-flow pollution) were found throughout the growing season in well-managed potato fields, with levels decreased by decreasing fertilization rate, use of slow-release N fertilizers oritrification inhibitors, or sprinkler application of N fertilizers. Careful water management with solid-set sprinklers proved capable of maintaining dissolved-N within the root zone of subsequent crops by season's end, even on very sandy sites. Alternate-furrow irrigation proved effective in 'trapping' banded fertilizer N within the plant root zone on heavier-textured furrow-irrigated soils. Periodic 'mining' of residual N by other crops in the rotation would still be necessary to prevent eventual return-flow contamination, however. (See also W78-07611) (Skogerboe-Colorado State)
W79-01001

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W79-01004

MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines Golden.
For primary bibliographic entry see Field 5B.
W79-01008

THE ORDINARY HIGH WATER MARK: ATTEMPTS AT SETTLING AN UNSETTLED BOUNDARY LINE,
Spessard L. Holland Law Center, Gainesville, FL.
For primary bibliographic entry see Field 6E.
W79-01009

IMPACT OF MINE DRAINAGE ON A MOUNTAIN STREAM IN PENNSYLVANIA,
Illinois Inst. of Tech., Chicago. Pritzker Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-01017

ABUNDANCE, DIVERSITY, AND STABILITY IN SHORE-ZONE FISH COMMUNITIES IN AN AREA OF LONG ISLAND SOUND AFFECTED BY THE THERMAL DISCHARGE OF A NUCLEAR POWER STATION,
Battelle Columbus Lab., Duxbury, MA.
For primary bibliographic entry see Field 5C.
W79-01021

BIOLOGICAL CONTROL AGENTS OF SEWAGE BACTERIA IN MARINE HABITATS,
New South Wales Univ., Kensignton, Australia. School of Microbiology.
For primary bibliographic entry see Field 5C.
W79-01027

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01038

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 8B.
W79-01053

EFFLUENT TREATMENT PLANT CLEANS UP DOWN THE VALLEYS,
For primary bibliographic entry see Field 5D.
W79-01078

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN.
Purdue Univ., Lafayette, IN. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-01096

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-01105

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 2F.
W79-01111

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Paper No. 77-2030 presented at American Society of Agricultural Engineers 1977 Annual Meeting, June 26-29, 1977. North Carolina State University. 16 p, 8 fig, 11 ref. OWRT A-083-NC(1), 14-34-0001-7070.

Descriptors: *Drainage control, *Nitrate, Nitrogen, Agricultural soils, *Water movement, Surface waters, Denitrification, Water level control, Coastal plain soils, *North Carolina.

Flashboard riser type water level control structures were installed in four tile mains or outlet ditches at two locations. Under controlled drainage conditions, there was a large decrease in both nitrate and drainage water lost through the artificial drainage systems. The effect on nitrate ultimately entering surface waters, however, is believed to depend on soil type.
W79-01137

THE FOX IN THE CHICKEN COOP: THE REGULATORY PROGRAM OF THE U.S. ARMY CORPS OF ENGINEERS,
Maryland Univ., Baltimore. School of Law.
For primary bibliographic entry see Field 6E.
W79-01141

INDIANS AND THE ENVIRONMENT: AN EXAMINATION OF JURISDICTIONAL ISSUES RELATIVE TO ENVIRONMENTAL MANAGEMENT,
George Washington Univ., Washington, DC. National Law Center.
For primary bibliographic entry see Field 6E.
W79-01143

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
R. L. Kuersteiner, and E. G. Herbach.
Santa Clara Law Review, Vol 18, No 1, p 157-80, 1978, 1 tab.

Descriptors: *Oceans, *Permits, *Water pollution sources, *Water pollution control, Disposal, Wastes, Water quality, Ultimate disposal, Water pollution, Legal aspects, Federal government, Legislation, International waters.

The Marine Protection, Research, and Sanctuaries Act, or Ocean Dumping Act (Act), was enacted by Congress in 1972 to regulate ocean dumping of refuse. The United States has also pursued international agreements to control waste dumping. Under the Act, permits are required to transport any material for dumping, whether the vehicle emanates from the United States or whether it is brought here by a federal agency or official. Permits for dumping dredged spoils are issued by the Secretary of the Army while other permits go through the Administrator of the federal Environmental Protection Agency. Civil and criminal sanctions are provided for violations, and a permit revocation procedure is established, as is a private right of action to enjoin a violator. The Act was amended in 1974 to prohibit disposal of chemical and biological warfare agents and high level radioactive wastes. Additionally, federal law was extended to regulate transportation of foreign-source material by United States flag vessels for ocean dumping. The Act must be examined with the Federal Water Pollution Control Act and the National Environmental Policy Act in order to determine its effectiveness. (Rule-Florida)
W79-01144

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
H. F. Wise.
Water and Sewage Works, Vol 124, No 10, p 84-85, October, 1977.

Descriptors: *Long-term planning, *Water management(Applied), *Urbanization, *Water quality control, Federal Water Pollution Control Act, Alternative planning, Comprehensive planning, Budgeting, Water allocation(Policy), Water pollution control, Future planning(Projected).

Several influences have brought about changes in urban land use practices. Realization of the costs of urban sprawl, management and control of urban growth, passage by Congress of environmental and resource legislation, the expansion of areawide councils of local government, and increasing state concern with costs of urban services have all contributed to the trend toward planning for gradual development rather than 'end-state' planning. Additionally, under the 1974 federal Housing and Community Development Act, those who receive comprehensive planning assistance funds must prepare a land-use element and a housing element in their comprehensive planning exercise. Quality management planning is influenced by Section 208 of the Federal Water Pollution Control Act (FWPCA), which requires that a region stage its growth. There must be an annually updated five year capital budget for sewage collector systems and treatment works. This would cause a staggering of development and phasing of induced social and economic effects. The implications of the non-point source management planning requirement of the 1972 FWPCA Amendments are just beginning to be understood, but will probably have the most direct influence on maintaining groundwater quality. (Rule-Florida)
W79-01146

FEDERAL COMMON LAW AND OCEAN POLLUTION: A PRIVATE REMEDY FOR OIL POLLUTION DAMAGE,
J. M. Glaeser.
Environmental Law, Vol 8, No 1, p 1-46, Fall 1977.

Descriptors: *Oil spills, *Remedies, *Federal jurisdiction, *Judicial decisions, Oceans, Common law, Oil pollution, Damages, Compensation, Oil industry, Cost allocation, Water quality standards.

There is a considerable lack of remedies available to private parties who suffer direct damages as a result of an increasing number of ocean oil spills. The federal common law offers great potential to fill the gaps found in current legal regimes. The first section of this article explores the inadequacy of present legal systems in providing compensation to private parties for damages resulting from oil spills. Available remedies, or lack thereof, within the international, national and state legal systems are discussed. The next section analyzes the development of federal common law, beginning with the landmark case of Erie Rail Road Company v. Tompkins. There is a detailed analysis of the recent case of Illinois v. City of Milwaukee and other cases following its holding. The case determined that where there was no specific remedy prescribed by Congress, federal courts may fashion one from applicable federal law. The Court implied further that courts may fashion federal law where federal rights are concerned, even where a remedy is available. The author concludes that, in the absence of adequate conventional remedies, federal common law should provide an interim remedy for private parties. (Quarles-Florida)
W79-01150

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
J. L. F. Silver.
Villanova Law Review, Vol 22, No 6, p 1122-70, 1976-77.

Descriptors: *Water quality standards, *Water pollution control, *Federal Water Pollution Control Act, Water Quality Act, Water quality control, Abatement, Evaluation, Administration, Regulation, Legislation.

The health- or technology-based regulatory schemes in water pollution control legislation have raised implementation problems. Enacted in response to shortcomings of the 1965 federal Water Quality Act, the Federal Water Pollution Control Act (FWPCA) provided direct, centralized federal control over effluent limitations, and establishment of effluent limitations based on practical considerations. Questions concerning the scope of the federal Environmental Protection Agency (EPA) authority to control effluent quality have been resolved, but administrative difficulties arising from the technology base of the statute remain. A health-based statute would force courts to consider whether to uphold EPA action that would terminate enterprises, while the technology-based statute disguises the decision as a question of whether a given technology or effluent standard is economically feasible. Cases decided under the FWPCA imply that the country may not be ready to make sacrifices necessary to achieve an acceptable environment. If so, the health or technology basis of the statute may not be important. Im-

proved Congressional drafting could help EPA achieve an effective pollution control system by reducing litigation, tying federal programs to compliance with related pollution control measures, and granting EPA a larger administrative staff. (Rule-Florida)
W79-01151

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
T. J. Schoenbaum, and K. G. Silliman.
Urban Law Annual, Vol 13, p 15-48, 1977.

Descriptors: *Coasts, *State jurisdiction, *Federal government, *Management, Constitutional law, Legal aspects, Legislation, North Carolina, Future planning(Projected), Planning, Regulation, Land development.

The development control technique of identifying areas of critical environmental concern is predicated on the ideas that some geographical areas possess unique characteristics which make special management treatment appropriate, and that the state should bear responsibility for these areas. But because the designation and management processes involved have been retarded by unresolved legal and technical problems, regulation of these areas has not been widely used as a planning technique. The technique will be increasingly important because the 1972 federal Coastal Zone Management Act requires that in order to qualify for federal coastal zone management grants, each state must include in its management program an inventory of areas of special concern within the coastal zone. Legislation in several states is evaluated in this article, with attention focused on the North Carolina statute. Additionally, there is a discussion of the limitations of administrative law and the constitutional restrictions of due process and equal protection as they apply to the administrative processes. The problem of characterizing the administrative designation of an area as on of critical concern as a taking of property without just compensation is also discussed. (Rule-Florida)
W79-01152

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
J. W. Hernandez.
Water and Sewage Works, Vol 124, No 10, p 67-69, October, 1977.

Descriptors: *Potable water, *Subsurface waters, *Underground waste disposal, *Injection, Water quality standards, Federal government, Administrative agencies, Waste disposal, Groundwater, Water management(Applied), Water conservation, Water permits.

Prior to the 1974 passage of the National Safe Drinking Water Act, the federal Environmental Protection Agency (EPA) was authorized to prescribe federal drinking water standards for water supplies used by interstate carriers. However, EPA may now establish standards for harmful contaminants in all public drinking water systems. Major provisions of the Act include the establishment of primary and secondary contaminant regulations, establishment of regulations to control subsurface injection, initiation of health, economic, and technological research, initiation of rural water surveys, and fund allocations to states to improve water supply programs. EPA requires National Pollutant Discharge Elimination System permits when a surface discharge permit is already in effect, and when a surface discharge has been replaced by a sub-surface disposal system. EPA policy is in opposition to the emplacement of pollutants by subsurface injection without strict control and a determination that waste injection will not interfere with use of groundwater resources. Under the Act, states will have enforcement responsibility for groundwater protection. State underground injection control programs must be EPA-approved, and provisions for the protection of sole-source aquifers will remain under EPA control. (Rule-Florida)
W79-01154

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
H. O. Banks.
Water and Sewage Works, Vol 124, No 10, p 73-75, October, 1977.

Descriptors: *Water quality control, *Water management(Applied), *National water commission, *Aquifer management, Groundwater resources, Subsurface waters, Aquifers, Water resources development, Administrative agencies, Water pollution control, Artificial recharge.

Management of groundwater resources and protection of groundwater quality has received considerable attention from the National Water Commission. Studies conducted by the Commission on state water and groundwater laws, management, and administration indicate that state groundwater law is often inadequate to allocate the resource, and is not responsive to the problem of excessive use. The Commission does not feel that Federal regulation is desirable, but that a new legal system should be instituted in some states to govern groundwater. Laws authorizing the establishment of agencies to manage both surface and groundwater should be enacted to coordinate withdrawals, control the rate of aquifer depletion, replenish aquifers through artificial recharge techniques, and protect them from pollution. Groundwater pollution may be more significant than pollution of surface water, but often the same quality control expertise must be applied to both. Agencies responsible for surface water pollution controls should also be responsible for groundwater abatement. Additionally, interstate aquifers should be managed and regulated in the same manner as intrastate aquifers. Finally, more technical data and other information is needed to make sound decisions regarding groundwater regulation and management. (Rule-Florida)
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
J. S. Moore.
Water and Sewage Works, Vol 124, No 11, p 99-100, November, 1977.

Descriptors: *Groundwater resources, *Water management(Applied), *Waste disposal, *Illinois, Administrative agencies, Landfills, Administration, Water quality control, Permits, Subsurface waters, Aquifer management, Injection.

The Division of Land Pollution Control of the Illinois Environmental Protection Agency is responsible for the safe, economical and environmental disposal of domestic, liquid, and hazardous wastes. This agency has permit authority in these areas and for underground injection wells, while the Illinois Department of Public Health and the state Department of Mines and Minerals share responsibility for groundwater protection. The State Geological Survey and State Water Survey for groundwater protection. The State Geological Survey and State Water Survey engage in research and resource interest. After the 1970 passage of the Illinois Environmental Protection Act, the state was able to develop solid-waste rules and regulations, and now has sanitary landfills instead of open-burning garbage dumps. Both liquid and special waste may be incorporated into solid-waste landfills in some areas, upon issuance of a special supplementary permit. Direct sanitary landfilling, subsurface injection, surface absorption, consignment burial and land spreading are used. Existing programs will be tied into the development of a state groundwater policy to address the legal responsibilities of various state agencies, define major aquifers and protective guidelines, and to develop statewide water level measurement and groundwater measuring networks. (Rule-Florida)
W79-01156

THERMAL DISCHARGES AND POWER PLANT INTAKES: SECTION 316 IN PERSPECTIVE,
G. S. P. Bergen.
Natural Resources Lawyer, Vol 11, No 2, p 305-23, 1978.

Descriptors: *Federal Water Pollution Control Act, *Thermal water, *Thermal powerplants, *Water quality standards, Permits, Cost-benefit analysis, Effluents, Cooling, Intake structures, Costs, Powerplants, Pollution abatement.

Section 316 of the Federal Water Pollution Control Act allows conditions in pollutant discharge permits for steam-electric power plants to be adjusted to meet the environmental and economic realities at individual sites. Section 316 serves the following functions: (1) it allows restrictions on discharges of heat to be relaxed; (2) it allows special permit conditions to be imposed to regulate intake structure location, design, construction and capacity on a cost-benefit basis; and (3) it immunizes a thermal discharge--modified to meet thermal effluent limitations--from the need to comply with any subsequent, more stringent, requirements for a period not to exceed 10 years. Application of the section has generated much controversy, because of its awkward structure and vagueness. The cost of retrofitting existing once-through cooling systems with closed-cycle cooling is enormous. Uncertainty exists as to the character and the significance of the environmental impacts actually caused by power plant discharges and intakes. The article begins with an orientation of Section 316 within the Act's framework. It then focuses individually on the three functions of the Section. The author concludes that, viewed with common sense, the elements of Section 316 can be rationally interpreted. (Quarles-Florida)
W79-01159

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
S. M. Harder, T. C. Daniel, and F. W. Madison.
Journal of Soil and Water Conservation, Vol 33, No 2, p 80-84, March-April, 1978.

Descriptors: *Erosion control, *Sedimentation control, *Federal water pollution control act, *Regulation, State governments, Local governments, Water pollution, Waste treatment, Legislation, Soil conservation, Sedimentation, Water quality.

State governments are in the best position to enact legislation providing minimum, uniform guidelines for mandatory erosion control programs. Local governments may then tailor these guidelines to meet their individual needs. This is the conclusion of this article reviewing programs implemented by local governments in attempting compliance with Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The law requires each state to develop areawide waste treatment management plans addressing both point and nonpoint pollution. The current emphasis is on nonpoint sources, with the most common problem being soil erosion and subsequent sedimentation. The problems with the use of local authority alone for reducing erosion are threefold. They are: (1) lack of county jurisdiction in incorporated areas; (2) restrictions placed on county authority to enact and enforce ordinances; and (3) lack of uniformity for water quality and economic effects. The report analyzes programs in Iowa, Michigan, Pennsylvania and Ohio. The article includes a consolidation of the best components of each program. Although the model program is not presented in detail, it should provide a basis for the development of a comprehensive, flexible erosion control program. (Quarles-Florida)
W79-01160

UP TO OUR WASTES IN WET SUITS: THE FEDERAL LAW ON WATER POLLUTION,
E. L. Lasseter, Jr.
Cumberland Law Review, Vol 8, No 3, p 731-61, Winter 1978.

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Federal government, *Remedies, Legislation, Toxins, Civil law, Commercial fishing, Navigable waters, Interstate rivers, Water pollution, Damages.

Under the 1972 federal Water Pollution Control Act the federal Environmental Protection Agency (EPA) has the authority to improve and maintain the quality of the nation's waters. While there is no express provision in the Act for private actions, violators can be assessed cleanup costs. A list of standards dealing with toxic pollutants is now in effect. The tools for enforcement exist under the Act, yet the question remains as to whether they will be used. Private persons who suffer specific damages as a result of water pollution are entitled to compensation. In addition, private damage actions may also be allowed. These two remedies are based on Section 13 of the federal Rivers and Harbors Act. This section, known as the Refuse Act, is the only one which deals with water pollution. Enforcement rests with the secretary of the Army. Because the quality of interstate and navigable waterways is primarily a federal concern, federal law in this area must be developed and applied. Water pollution causes specific injuries to others than commercial fisherman and riparian landowners, and the law must take notice of these others who are damaged. (Spiegel-Florida)
W79-01161

A COMPARISON OF BETHLEHEM STEEL CORP V. TRAIN WITH REPUBLIC STEEL CORP. V. TRAIN: THE SIXTH CIRCUIT,
A. W. Staver.
Environmental Law, Vol 8, No 1, p 173-201, Fal, 1977.

Descriptors: *Federal Water Pollution Control Act, *Judicial decisions, *Water pollution control, *Analysis, Water quality, Water pollution, Pollutants, Legislation, Effluents, Water quality control, Water quality standards, Industrial wastes.

The 1972 Federal Water Pollution Control Act Amendments contain an unequivocal 1977 deadline for the achievement of effluent limitations for point sources using the best practicable control technology available. However, the mutability of that deadline has been the central issue in two important judicial decisions construing the Act. Bethlehem Steel Corporation challenged the deadline in one case, but the Third (Federal) Circuit refused to grant an extension. Republic Steel Corporation met with more success in the Sixth (Federal) Circuit, which held that the deadline was unenforceable due to the federal Environmental Protection Agency's failure to promulgate the effluent limitations for the steel industry. This article analyzes this conflict between the two Circuit Court decisions. In order to understand the issues, a discussion of the relevant sections of the Act is included. The author concludes that the Sixth Circuit's Republic decision was decided incorrectly in light of the express language of the statute and its legislative history. This is borne out by the case's inconsistency with Supreme Court decisions, other environmental studies and the equitable considerations involved. (Quarles-Florida)
W79-01162

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
W. D. Seitz, and R. G. Spitze.
Journal of Soil and Water Conservation, Vol 33, No 3, p 118-125, May-June, 1978, 4 fig, 3 tab.

Descriptors: *Erosion control, *Sediment control, *Planning, *Water pollution treatment, Erosion, Soil erosion, Sedimentation, Agriculture, Pollutants, Water quality, Planning, Cost analysis.

Plans to control non-point sources of water pollution are being developed in accordance with the law. These plans must include policies and procedures for reducing the level of pollutants generated by agriculture, primarily via soil erosion. This article presents a system for policy development that can be used in this area, as well as other problem areas. Component steps in alternative policies are identified, and ways to achieve each step are explained. A broad range of planning possibilities are available to planners. Administrative costs of several policies are estimated with a cost-synthesis approach. The analysis begins by tracing the history of conservation institutions that arose as public policy responses to soil erosion problems. The present status of soil conservation districts across the country is explored. The scheme for policy development presented has five principal components: (1) control instruments; (2) performance indicators; (3) control techniques; (4) compliance measures; and (5) temporary penalties. Specific examples of the use of the scheme in designing alternative erosion and sediment control policies are presented. Necessary changes in existing institutional arrangements are also explored. (Quarles-Florida)
W79-01164

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okum.
Journal of the Environmental Engineering Division (ASCE), Vol 103, No EE6, p 1039-55, December, 1977.

Descriptors: *Water management(Applied), *Regional development, *Water quality control, *Water policy, Water pollution, Water pollution control, Water supply, Potable water, Water quality, Environmental engineering, Engineering, Technology.

Environmental engineers must become involved in the establishment of goals for water quality and methods for attaining these goals. This article proposes five principles to initiate consideration among environmental engineers of a philosophy for water quality management. These five axioms of sound water management are: (1) every water project is unique; (2) the efficiencies and economies of scale inherent in water projects should be exploited; (3) in general, those who benefit from water projects should bear the costs; (4) potable water should be drawn from protected rather than polluted sources; and (5) the management of water supply and water pollution control should be integrated. The proponent of these principles is an engineer who is disturbed by the increasing importance of regulation rather than quality engineering. He discusses the recent revolution in water management in England. The five enumerated principles are drawn from the experience there. These principles are discussed at some length. The author also urges a regional approach to water management. The reluctance of communities to yield sovereignty over their water supplies is cited as the major obstacle to regionalization. (Quarles-Florida)
W79-01165

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
L. Popovich.
Journal of Forestry, Vol 75, No 11, p 726-30, November, 1977.

Descriptors: *Forest watersheds, *Oregon, *National parks, *Water quality control, Forestry, Water, Forest management, Watershed management, Legislation, Water supply, Land management, Recreation.

The U.S. House of Representatives' Interior Committee has reported out a bill to provide for water quality and forest management on the Bull Run (Oregon) watershed located on Mt. Hood National Forest. The Forest Service manages the land today, since it is in a national forest. The Service authorized timber sales on the watershed in 1958. However, in 1973, a class action suit was brought under the Trespass Act, a statute prohibiting any use of the watershed that threatens water quality. The court found that timber harvesting did not protect water quality and closed the area to logging and recreation. Existing logging contracts were permitted to be honored. To insure water quality, Portland city fathers are angling for equal management authority and a federally funded water treatment plant. The Forest Service does not wish to share authority in exchange for harvesting rights, but this appears to be the direction of the end result. The pending bill would repeal the Trespass Act and permit harvesting, but water quality would still be of primary concern. (Quarles-Florida)
W79-01166

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield.
For primary bibliographic entry see Field 6E.
W79-01168

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 6, NEW ORLEANS, LA.).
For primary bibliographic entry see Field 6E.
W79-01169

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 7, BURLINGTON, VT.).
For primary bibliographic entry see Field 6E.
W79-01170

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 9, WASHINGTON, D.C.).
For primary bibliographic entry see Field 6E.
W79-01171

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (APPENDIX, STATEMENTS SUBMITTED FOR THE RECORD).
For primary bibliographic entry see Field 6E.
W79-01172

OIL POLLUTION LIABILITY.
For primary bibliographic entry see Field 6E.
W79-01173

WATER CONTAMINATION BY TOXIC POLLUTANTS: AN ASSESSMENT OF REGULATION,
Library of Congress, Washington, DC. Div. of Environment and Natural Resources Policy.
For primary bibliographic entry see Field 6E.
W79-01174

BOND STREET AND WEATHERBEST SLIP BOATHOUSE OWNERS V. CITY OF NORTH TONAWANDA (CITY MAY NOT TERMINATE WATER SERVICE TO A CUSTOMER IN GOOD STANDING).
For primary bibliographic entry see Field 6E.
W79-01187

METALLIC MINING RECLAMATION ACT,
For primary bibliographic entry see Field 6E.
W79-01188

PHILADELPHIA CHEWING GUM CO. V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (LAND-OWNERS AND OCCUPIERS LIABLE FOR CORRECTION OF POLLUTING CONDITION).
For primary bibliographic entry see Field 6E.
W79-01191

WARRIOR, INC. V. EASTERLY (DEVELOPER ASSESSED DAMAGES CAUSED BY EXCESS DRAINAGE WATER AND DEBRIS POLLUTING LANDOWNER'S POND,
For primary bibliographic entry see Field 6E.
W79-01192

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 214, Price codes: A10 in paper copy, A01 in microfiche. Publication No. EPA 230/3-77-015B, July 1977. 222 p. 38 fig, 2 append. 68-01-2832.

Descriptors: *Iron and steel industry, *Regulation, *Costs, *Economic impact, *Pollution abatement, *Analytical techniques, *Water pollution control, Iron, Steel, Computer models, Air pollution, Model studies, Capital costs, Industrial wastes, Financing, Industrial production, Operation and maintenance, Effluents, Effluent limitations, Emission standards, Operating costs, Economics, Planning.

This volume, second of two-parts, describes the research methodology of a study of the economic impact of environmental regulations on the iron and steel industry. Analysis results are contained in Volume I. A computer model of the steel industry, PTm(Steel), one of a series of policy testing models, incorporates structural relationships among processes, flows, capital, and regulatory requirements, but is independent of assumptions about exogenous conditions, such as demand or interest rate, and behavior, such as capital structure. PTm(Steel) has three major components: (1) determination of production flows by process, and resulting capital needs, and computation of operation and maintenance costs; (2) costs of pollution control, separated into water and air modules; and (3) finance, in which these costs and capital needs are combined to display results of operations in terms of capital expenditure, external financing, operations and maintenance expenses, required revenues, and average price effects. policy analysis is performed with the model by incremental analysis. Data represent 93% of domestic steel shipment. Costs and impact cover from receipt of raw materials at the blast furnace or coke oven site through finishing mills. Costs of raw materials production and transport, and fabrication of steel products, are excludeddued. (Lynch-Wisconsin)
W79-01194

AQUATIC WEED MANAGEMENT: SOME PROSPECTS FOR THE SUDAN AND THE NILE BASIN, REPORT OF A WORKSHOP HELD AT KHARTOUM, SUDAN ON 24-29 NOVEMBER 1975.
Agricultural Research Council, Khartoum (Sudan).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 990, Price codes: A04 in paper copy, A01 in microfiche. 1975. 57 p, 1 fig, 2 tab, 20 ref, 3 append. BOA AID/csd-2584.

Descriptors: *Aquatic weed control, *Water hyacinth, *Sudan, *Nile River Basin, *Beneficial use, *Biocontrol, *Chemcontrol, *Bilharzia, *Public health, Eichhornia crassipes, Rivers, Swamps, Lakes, Irrigation canals, River basins, White amur, Ctenopharyngodon idella, Water buffalo, Biogas, Methane, Utricularia, Feeds, Energy, Neochetina eichhorniae, Silage, Submerged plants.

A workshop on aquatic weed management in the Sudan and Nile River Basin (24-29 November 1975) surveyed biological and chemical control measures for water hyacinth (Eichhornia crassipes) and submerged irrigation canal weeds, and their possible beneficial uses. Recommendations called for: (1) regional cooperation between countries of the Nile Basin; (2) a ban on importing foreign aquatic plants and restrictions on the spread of plants; (3) continuation of 2,4-D spraying; (4) introduction of the water hyacinth weevil (Neochetina eichhorniae) for biocontrol testing; (5) construction of small biogas generators for methane production from weeds; (6) experiments on ensiling pressed hyacinth for animal feeds; (7) testing of composts and mulches from aquatic weeds; (8) trials with white amur fish (Ctenopharyngodon idella) prior to release into chanels; (9) introduction of water buffalo from Egypt into other parts of the region for weed control, food, and power; (10) testing of geese, such as white Chinese geese, for weed control; (11) research on bladderwort (Utricularia) for Bilharzia control; (12) tests on use of hyacinth as human food; (13) study of the use of spikerushes (Eleocharis) to create 'underwater lawns' for displacement of taller weeds in canals; (14) use of hyacinth for sewage treatment in Egypt, but not in the Sudan because of the danger of infecting areas of the Nile and Blue Nile now free fo the weed. (Lynch-Wisconsin)
W79-01205

EVALUATION OF THE IMPACT OF THE MINES DEVELOPMENT, INCORPORATED MILL ON WATER QUALITY CONDITIONS IN THE CHEYENNE RIVER.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5B.
W79-01209

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 655, Price codes: A03 in paper copy, A01 in microfiche. Report No. MCD-04, May 1976. 41 p, 1 fig, 1 append.

Descriptors: *Waste water treatment, *Municipal wastes, *Grants, Federal Water Pollution Control Act, Projects, Contracts, Financing, Water pollution treatment, Treatment facilities, Legislation, Construction, Construction costs, Sewage, Sewage treatment, Project planning, Alternative planning, Cost effectiveness.

The requirements for obtaining Federal grants for construction of municipal wastewater treatment facilities are summarized and the responsibilities borne by each participant are described. The information provided includes a discussion of pre-application considerations, such as eligibility, types of projects, the priority list, and the State water quality management plan. The application process includes preparing a plan of study and choosing a professional engineer. A number of suggestions for designing the facility are discussed, including alternatives, effluent limitations, infiltration/inflow analysis, and sewer system evaluation surveys. Some information concerning plans, specifications, and estimates is provided and related legislation is noted. A brief list of technical provisions essential for a project is supplied and steps to be followed in arranging construction are discussed including: receipt and review of bids, changes in the amount of the grant, awarding of construction contracts, and on-site inspection by the granting agency. Other program elements covered are allowable and unallowable costs, cost effectiveness, and force account. References to Federal legislation and other publications which can be of assistance to applicants is supplied and addresses are given for regional offices of the Environmental Protection Agency administrators. (Majtenyi-IPA)
W79-01210

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-01213

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W79-01229

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W79-01242

THE EFFECT OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
H. D. Drechsler, and P. N. Nemetz.
Water Resources Bulletin, Vol. 14, No. 5, p 1094-1104, October 1978. 7 fig, 1 tab, 11 ref.

Descriptors: *Water pollution control, *Sampling, *Monitoring, Water sampling, Biology, Bioindicators, Pollutants, Water pollution, Water pollution sources, Fish, Toxicity, Damages, Effluents, Regulation, Freshwater, Sea water, Statistics, Analytical techniques.

The hypothesis that the frequently used regulatory practice which employs point estimates in water pollution control objectives, in combination with monitoring at infrequent intervals, is an inadequate scientific procedure for the measurement and control of pollution. The first part of the paper outlined the relevant sampling theory which applies to the measurement of effluent from industrial plants and described the possible errors in sampling practice which currently affect the interpretation and enforcement of environmental standards. In the second part of the paper, the environmental significance of biological damage functions was described briefly. In the final part of the paper, it was recommended that existing pollution control regulations be restructured to be more efficient and effective in the protection of both corporate and social interests. By adopting two different approaches to regulation, depending upon the nature of the appropriate damage functions and critical fish species, it is possible to reduce significantly the waste of resources. (Sims-ISWS)
W79-01243

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 5B.
W79-01245

REAERATION PERFORMANCE OF STEPPED CASCADES,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. H. Y. Tebbutt, I. T. S. Essery, and S. K. Rasaratnam.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4, p 285-297, July 1977. 9 fig, 9 ref.

Descriptors: *Reaeration, *Dissolved oxygen, *Laboratory tests, *Hydraulic models, Water quality, Hydraulic structures, Rivers, Weirs, Step-downs, Analytical techniques, Analysis, Model studies, Water temperature, Equations, Overfalls, Foreign research, Stepped cascades.

Reaeratuion was studied in a hydraulic model. A universal cascade structures 150 mm wide was built to permit study of a variety of configurations. Three slopes (H/L) of 1:1, 1:2.5, and 1:5 were investigated with individual step heights (H) of 50, 100, 250, and 500 mm for the 1:1 and 1:2.5 slopes, but omitting the 500 mm step height for the 1:5 slope, which had an overall fall of 1 m compared

with the 2 m fall used for the other two slopes. Most of the work was undertaken with horizontal step treads, but structures with a step length (L) of 250 mm also were studied with 10 deg and 20 deg raked treads. Three standard rates of flow (q) of 1000, 5000, and 12,500 cu m/md were used for all structures, with some additional data collected at intermediate flows. Oxygen deficits in the inflow to the cascade were controlled by the addition of sodium sulphite and cobalt chloride solutions to the suction side of the pump. These studies showed that the reaeration behavior of different cascade structures and flow rates can be conflated into a single plot using parameters describing flow, reaeration, and cascade slope. The main factors controlling reaeration performance in cascades are flow per unit width and total fall with secondary influences due to step height and cascade slope. The reaeration provided by a stepped cascade can be a useful aid in controlling receiving water quality in situations with little dilution and without the expenditure of any additional energy in the treatment process. (Humphreys-ISWS)
W79-01249

REMOVAL AND SEPARATION OF SPILLED HAZARDOUS MATERIALS FROM IMPOUNDMENT BOTTOMS,
Hittman Associates, Inc., Columbia, MD.
M. A. Nawrocki.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 140, Price codes: A05 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-245, September 1976. 78 p, 14 fig, 16 tab, 4 ref, 3 append. 68-03-0304.

Descriptors: *Dredging, *Water pollution treatment, *Separation techniques, Hazards, *Filtration, Suspended solids, Water quality control, Impoundments, Ponds, Pumping, Evaluation, Testing, On-site investigations, Efficiencies, Abatement, Slurries, Portable processing systems.

A system for removing spilled hazardous materials from pond bottoms and separating hazardous materials and suspended solids from the resulting dredged slurry was demonstrated. The system consisted of a MUD CAT dredge capable of pumping 1500 gal/m of discharge containing 10% solids, two elevated clarifier bins placed in series, a bank of six 4-inch diameter hydrocyclone cones, a conventional cartridge filter unit, ad a new Uni-Flow bag-type filter. Tests were conducted by placing four different simulatd hazardous materials on the pond bottom to determine efficiency of both removal and separation from the resulting slurry. Results showed 99.3% efficiency of removal for fine iron, fine glass beads, iron filings, and coal. Overall processing separated 99.9% of the iron powder from the slurry and 100% of the other three materials. Testing on removal of latex paint as a real hazardous material gave 95.5% efficiency. Further evaluations and investigations were conductd on the tested apparatus and other equipment that could be used in a full 1500 gal/m portable processing system. A system consisting of a portable scalping-classifying tank combined with spiral classifiers, a Uni-flow filter, and an inclined tube settler was designed and a preliminary analysis was conducted. (Majtenyi-IPA)
W79-01307

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. VOLUME 3. SUMMARIES OF TECHNICAL DATA FOR COMBINED SEWER OVERFLOWS AND STORMWATER DISCHARGE. 1976 NEEDS SURVEY,
Environmental Protection Agency, Washington, DC. Office of Water Programs Operations.
J. A. Chamblee.
Available from the National Technical Information Service Springfield, VA 22161 as PB-266 719, Price codes: A18 in paper copy, A01 in microfiche. Rept. Nos. EPA-430/9-76-012, and MCD 48C Vol III of III, Feb 1977 395 p, 16 fig, 37 tab, 67 ref, 4 app. 68-01-1984.

Descriptors: *Waste water treatment, *Costs, *Computer models, *Estimated costs, Sewers, Storm water, Urban hydrology, Urban runoff, Storm runoff, Surveys, Forecasting, Computer programs, Water quality control, Esthetics, Wildlife, Fish, Recreation.

A well defined, consistent nationwide methodology was applied for development of present and 1990 capital, operation, and maintenance cost estimates for combined sewer overflow correction and control of storm waters. Estimates were based on attainment of quality criteria in the areas of esthetics, Fish and wildlife, and recreation. A computer model, called the Needs Estimation Model for Urban runoff, was developed from intensive work with the literature of a detailed analysos of ten specific urbanized areas. The model calculates the combined sewer and stormwater control needs for each urbanized area and then these estimates are summed on a state and territory basis to provide national estimates. The estimated needs obtained using this model are significantly lower than those developd by earlier surveys as a result of the following factors: (1) consideration of receiving water assimilative capacity; (2) a relatively small design storm; (3) a well defined area for storm water control; and (4) a nationwide consistent methodology. Cost estimates for treatment and/or control of stormwater discharges are of better quality variables affecting costs in this area. (Majtenyi-IPA)
W79-01308

IMPLEMENTING 'BEST MANAGEMENT PRACTICES' FOR RESIDUALS: THE WASTE EXCHANGE,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
A. K. Vitberg, M. L. Rucker, and G. H. Porter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 068, Price codes: A03 in paper copy, A01 in microfiche. Report Nos. EPA-440/9-76-019 and WPD 6-76-01, September 1976. 26 p, 4 tab, 4 append.

Descriptors: *Industrial waste, *Recycling, *Conservation, *Waste water treatment, Management, Waste exchange, Environmental effects, Information exchange, Economics.

Waste exchage systems are described as a means of dealing with industrial wastes and residuals while, at the same time, using and conserving valuable resources and aiding in imlementing best management practices. Essentially, waste exchange involves extracting potentially valuable materials from wastes and marketing them to users, thus conserving valuable raw materials. Several types of waste exchange systems are distinguished, such as those which limit themselves to transferring information and referring potential sellers and buyers to each other ad those which also physically handle the wastes. Each of these may be subdivided into active or passive systems, depending on whether they seek out potential waste users or wait for users to seek information on wastes. A number of specific design characteristics are tabulated and the role of state and areawide planning agencies is discussed. Appendices described European and American clearinghouses and give examples of the American clearinghouse listings. (Majtenyi-IPA)
W79-01309

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01312

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01313

FEASIBILITY STUDY, FLY ASH RECLAMATION OF SURFACE MINES, HILLMAN STATE PARK, FEASIBILITY STUDY,
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, PA.
M. T. Dougherty, and H. H. Holzen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 485, Price codes: A05 in paper copy, A01 in microfiche. Feasibility Report No EPA-600/2/76-183, August 1976. 81 p, 18 fig, 24 tab, 1 append. S-802526.

Descriptors: *Land reclamation, *Strip mines, *Water quality, *Recreation, *Fly ash, Acidic water, Feasibility, Mine drainage, Soils, Soil conservation, Soil physical properties, Hydrogen ion concentration, Particle size, Soil moisture, Costs, Legumes, Grasses, Environmental engineering, Landscaping.

The use of pulverized fuel fly ash for surface treatment of regraded acidic strip mine spoils was studied and found to be technically feasible and suitable for producing a soil cover capable of sustaining grasses and legumes and enhancing abatement of mine drainage. It was determined that fly ash and spoil mixtures are favorable because fly ash neutralizes acidic materials in the spoils and also improves moisture retention characteristics. A feasibility study was carried out for a demonstration project in which fly ash application would be used to reclaim strip mined land which would then be used for recreational purposes. Criteria for water quality for the project were based on data obtained from Hillman State Park in Pennsylvania and also included: pH of the strip mine spoil material and fly ash; moisture retention characteristics of treated and untreated spoils; and grain size distribution of spoils and fly ash treated spoils. It was predicted that alkalinity in the tributaries affected by the demonstration should increase approximately 200 mg/l and that land would be useable. Estimated cost for restoration of the 340-acre demonstration site is about $900,000 and regrading and revegetating will cost an added $70,000. (Majtenyi-IPA)
W79-01323

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W79-01329

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

A WATER POLLUTION SURVEY, MAINLY BY BRITISH SCHOOL CHILDREN,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
K. Mellanby.
Environ Pollut. 6(3), p 161-173, 1974.

Descriptors: *Indicators, *Invertebrates, Maps, Rivers, Species, Streams, Survey, *United-Kingdom, *Water pollution.

A simple kit was used by 8000 children to estimate water pollution in rivers and streams in Britain. The most valuable results were obtained by determining the presence or absence of chosen 'indicator' species of invertebrates. The results compare favorably with existing data professionally collected, but give more details than were previously recorded for many areas. Copyright 1974, Biological Abstracts, Inc.
W79-01354

PTIMAL OPERATION OF LARGE AGRI-CULTURAL WATERSHEDS WITH WATER UALITY CONSTRAINTS,
exas A and M Univ., College Station. Water esources Inst.
or primary bibliographic entry see Field 4D.
79-01355

EOCHEMISTRY OF MINE EFFLUENTS IN HE FRONT RANGE MINERAL BELT OF OLORADO,
olorado School of Mines, Golden.
or primary bibliographic entry see Field 5A.
79-01363

VATER-QUALITY INDICES FOR SPECIFIC VATER USES,
eological Survey, Oklahoma City, OK. Water esources Div.
D. Stoner.
ircular 770, 1978. 12 p, 1 fig, 8 tab, 7 ref.

escriptors: *Water quality standards, *Water upply, *Potable water, Irrigation, *Water quality, Vater management(Applied), Water utilization, lethodology, *Water quality indices, *Public vater supplies.

Vater-quality indices were developed to assess vaters for two specific uses--public water supply nd irrigation. The assessment for a spcific water se is based on the availability f (of (1) a set of mits for each water quality property selected, (2) rationale for selection, and (3) information that ermits one to appraise the relationship of the oncentration of the selected property to the suit-ility of the specific water use. The selected prop-rties are divided into two classes: Type-I proper-es, those normaly considered toxic at low concen-ations, and type-II properties, those which affect esthetic conditions or which at high concentra-ons can be considered toxic or would otherwise ender the water unfit for its intended use. (Woo-ard-USGS)
79-01381

IETHOD AND DEVICE FOR SEPARATION F SUSPENDED MATERIAL FROM A FLUID LOW,
araisten Kalkki Oy, Pargas (Finland). (Assignee).
or primary bibliographic entry see Field 5D.
79-01392

IL BOOM FOR DAMMING AND COLLECT-NG A FLOATING OIL SLICK,
ridgestone Tire Co., Ltd., Tokyo (Japan). (As-gnee).
Muramatsu, T. Fukai, and H. Takahashi.
S. Patent No. 4,096,700, 11 p, 10 fig, 6 ref; fficial Gazette of the United States Patent Office, ol 971, No 4, p 1339, June 27, 1978.

escriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, Water quality control, loating, Equipment, *Oil booms, Containment, il slicks.

n oil boom for damming and collecting a floating l slick comprises two rows of upper and lower ream side floats spaced apart from each other and rtly submerged in water, and a flexible base eet connected across base portions of the two ws of floats which hangs down into the water in gently curved shape. Inlet openings are arranged ear the upper stream side float and extend in its ngthwise direction; and an inflow guide plate is ade integral with the flexible base sheet and is ranged below the inlet openings projecting ward the upper stream side in a direction parallel ith the water surface. Outlet openings are ar-nged in a rear portion of the flexible base sheet d extend in its lengthwise direction. The total ening area of the outlet openings per unit length the flexible base sheet is larger than that of the let openings. (Sinha-OEIS)
79-01394

ALGAECIDAL COMPOSITION,
Applied Biochemists, Inc., Mequon, WI. (Assignee).
For primary bibliographic entry see Field 5F.
W79-01401

METHODS AND COMPOSITIONS FOR DISPERSING OIL FILMS,
United States Steel Corp., Pittsburgh, PA. (Assignee).
C. Perlaky.
U.S. Patent No. 4,098,694, 4 p, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 255, July 4, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Industrial wastes, *Water quality control, Thin films, Chemical reactions, Organic compounds, Mixing.

This invention provides composition and methods for dispersing thin oil films in water by the use of non-ionic dispersants dissolved in large proportions of organic water-insoluble oxygenated compounds. Such compositions will disperse oil films but are also biodegradable, non-foaming, relatively inexpensive, and are generally unseparated mixtures of alcohols, esters, aldehydes and/or other carbonyl compounds. The invention is also directed towards providing simple means for mixing the dispersing composition with the oil-covered water body. (Sinha-OEIS)
W79-01407

METHOD FOR SEQUESTERING METAL IONS,
Benckiser-Knapsack G.m.b.H., Ladenburg am Neckar (West Germany) (Assignee).
K. Sommer, and G. Raab.
U.S. Patent No. 4,100,067, 5 p, 12 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 716, July 11, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, Industrial water, Water softening, *Scaling, *Corrosion, Organic compounds.

Valuable amino alkane diphosphonic acids in which one or both hydrogen atoms of the amino group are substituted by hydroxy alkane groups, and their alkali metal salts and a process of using them are described. The compounds are highly water-soluble, are stable against hydrolysis even at temperatures exceeding 100C., and have a high sequestering power so that they can be used advantageously in processing aqueous media of considerable hardness, and in suppressing scale and corrosion in aqueous media used for heat treatment of containers. (Sinha-OEIS)
W79-01417

EFFLUENT OIL COLLECTING VESSEL,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Uchida, H. Takeshita, and S. Yamazaki.
U.S. Patent No. 4,100,072, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 718, July 11, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, Water quality control, Waves(Water), Jets, Equipment, Suction, Twin-hull vessels.

An effluent oil collecting vessel of twin-hull type is described in which in the space between the opposite hulls, a float-suction section provided with a jet water injection port is hung from the hulls via linkage means so as to continuously follow the waves. There are rubber guides to prevent the effluent oil from leaking backwards through the gaps between the hulls and the float-suction section, and oily water introduced to the float-suction section is sucked by an ejector and fed to a tank in the vessel. (Sinha-OEIS)
W79-01419

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6G.
W79-01431

WATERFOWL COLLISIONS WITH POWER LINES AT A COAL-FIRED POWER PLANT,
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 6G.
W79-01434

NONMETALLIC ELUTRIATION AND SIEVING DEVICE FOR BENTHIC MACROFAUNA,
Naval Oceanographic Office, Washington, DC. Ocean Science Dept.
R. A. Pedrick.
Limnol Oceanogr. 19(3), p 535-538, 1974.

Descriptors: Benthic fauna, *Elutriation, Heavy metals, Sieving, Instrumentation, Water pollution control.

This simply built device for shipboard use incorporates a tilt adjustable 57-1 drum and an effluent collector of high density polyethylene. The nonmetallic construction removes possible sources of heavy metals contamination; and enclosed elutriation drum top helps prevent spillage.--Copyright 1974, Biological Abstracts, Inc.
W79-01447

POLLUTION ABATEMENT FACILITIES AT NATIONAL FISH HATCHERIES,
Fish and Wildlife Service, Portland, OR.
M. A. Smith.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974. p 10-14, 5 fig.

Descriptors: *Aquiculture, Fish diets, Fish establishment, Fish farming, *Fish hatcheries, *Wastes, *Waste water treatment, Salmon hatcheries, Washington, *Sedimentation, Solids separation, Lamellar separations, Settling basins, Fish hatchery wastes.

Studies conducted by the Fish and Wildlife Service have indicated that the only pollutant of significance in fish hatchery effluent is fish feces. Control by sedimentation was found to be the only practical method of pollution control tested by the service. (EIS-Katz)
W79-01463

EVALUATION OF CLINOPTILOLITE FOR AMMONIA REMOVAL,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 5D.
W79-01464

REVIEW OF R & D ON WATER HYACINTH UTILIZATION IN THE PHILIPPINE REPUBLIC,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 4A.
W79-01470

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01491

A NOTE ON THE USE OF TAXES TO CONTROL POLLUTION,
Southampton Univ. (England).
M. S. Common.
Scandinavian Journal of Economics, Vol. 79, No. 3, p 346-349, 1977. 2 ref.

Descriptors: *Pollution taxes(Charges), *Pollution abatement, *Economics, *Standards, *Input-output analysis, *Resource inputs, Regulation, Optimization, Costs, Equations, Monitoring, Industrial production, Pollutants, Production function, Welfare(Economics).

Taxing resource inputs may in some circumstances be a more feasible approach to pollution control than a charge on emissions; this has implications not only for achieving arbitrary pollution standards (in which context this argument is developed), but also for securing optimal pollution and for direct controls. Under Baumol and Oates's uniform emission tax, derived from their least-cost theorem, independent cost-minimizing firms meet an overall pollution standard at the least aggregate resource cost to society. However: (1) the feasibility of the uniform charge depends upon the feasibility and cost of monitoring emissions, and (2) though their analysis implies that output is a function of emissions, emissions may usefully be considered a joint product with output; emissions cannot be produced with zero inputs. At least one resource input must be linked to waste emissions, allowing the possibility that waste discharges can be reduced with constant output by increasing some resource inputs. It is demonstrated that there is a set of tax rates on resource inputs which will lead independent cost-minimizing firms to meet an overall pollution standard at the least aggregate resource cost; thus there are the options of taxing either emissions or inputs, the preference presumably dependent on type of pollutant. An advantage of taxing inputs is that firms must monitor their own inputs, but a disadvantage is that the tax rate varies across firms. (Lynch-Wisconsin)
W79-01496

THE 'STANDARDS AND PRICE' APPROACH TO POLLUTION CONTROL: PROBLEMS OF ITERATION,
Newcastle-upon-Tyne Univ. (England).
M. Walker, and D. J. Storey.
Scandinavian Journal of Economics, Vol. 79, No. 1, p 99-109, 1977. 5 fig, 8 ref.

Descriptors: *Economics, *Pollution abatement, *Standards, *Iteration, *Pollution taxes(Charges), Optimization, Costs, Monitoring, Information, Trade-offs, Regulation, Equilibrium, Marginal costs, Pricing.

Critical examination of the iterative procedure used to generate information in calculating pollution taxes shows that it cannot be assumed either that equilibrium tax rates exist, or that where they do exist an iterative method would necessarily yield the standard at minimum resource cost to society. Baumol and Oates (1971) proposed that specific pollution standards be set by some political/scientific mechanism, and that a public authority should set a tax, observe firms' reactions, and utilize this information to calculate the correct tax level. The present study agrees that direct discharge restrictions would require extensive information on simultaneous relationships and on each polluter's marginal costs. But it is argued that Baumol and Oates seriously underestimate the information costs of their own scheme, including the slow, uncertain path to achievement of the standard, plus firms' adjustment costs. There is also an important trade-off between costs of collecting and utilizing a-priori information on the alternatives available for cutbacks, and costs of iteration. This analysis assumes: (1) no change in technology or in relative prices (except environmental); (2) that all changes in effluent load are caused solely by changes in the price/tax rate; (3) that the public authority must achieve the standard with no a-priori information on firms' abatement costs; and (4) that firms attempt to minimize the sum of expected discounted abatement costs and expected effluent taxes. (Lynch-Wisconsin)
W79-01497

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
J. C. Wade, and E. O. Heady.
Agriculture and Environment, Vol. 3, No. 4, p 307-323, 1977. 6 fig, 3 tab, 12 ref. NSF RANN GI-32990.

Descriptors: *Planning, *Economics, *Alternative planning, *Sediments, *Crop production, *Water pollution control, *Regulation, *Policy, *Land use, Agriculture, Nonpoint pollution, Mathematical models, Model studies, Costs, Cost-benefit analysis, Streams, Soil erosion.

A mathematical model assesses adjustments in agricultural crop production patterns resulting from national regulationl of nonpoint sediment pollution of waters. The model is evaluated with five hypothetical alternatives: (1) unrestricted sediment movement or loads in the stream system; (2) minimizing total national sediment load, and total production and transportation costs; (3) T-limit, which examines stream quality effects of limiting soil loss in each of 105 producing areas (PAs) to the level required to maintain productivity on each class of soil; (4) PA-limit, which restrains cropland sediment load contributions to 20% less than the base solution for each PA; and (5) river basin limit, requiring 20% reduction in the cropland portion of sediment loads at each river basin outflow rather than at the PA level. Four variables are considered: sediment loads to measure environmental improvement, land use and commodity production to measure input-output changes in commodity production, and national production cost to measure national agricultural economic change. The analysis did not indicate a best sediment control policy; all alternatives present major administrative problems. Only the T-limit alternative could be administered without major subsidies to maintain commodity production, but it would require excessive policing. Costs of the minimum sediment alternative greatly exceed benefits. (Lynch-Wisconsin)
W79-01498

THE RESPONSE OF FIRMS TO POLLUTION CHARGES,
Concordia Univ., Montreal (Quebec).
W. A. Sims.
Concordia University Working Paper No. 1977-7, 1977. 33 p, 2 fig, 2 tab, 2 append.

Descriptors: *Economics, *Mathematical models, *Brewing industry, *Pollution taxes(Charges), *Water pollution control, *Sewer effluent charges, *Canada, Effluents, Regulation, Pollution abatement, Economic impact, Model studies, Elasticity of demand, Welfare(Economics), Water demand.

A model incorporating standard neoclassical production theory was used to analyze the response of firms to pollution charges. Sewer effluent charge schemes, currently the only form of effluent charge system in use in Canada, distort water demand by firms subject to them because they allow free base emissions. A method of measuring this welfare loss is suggested. It is pointed out that these free base emissions also affect the response of firms to the actual charges: the reduction of pollution is less than under a comparable pure effluent charge scheme and the firm is induced to increase water volume used to carry away waste (V) with the increase in the dollar charge per pound of emissions (EC). Different theoretical responses of a firm to sewer effluent charges are discussed, and estimates are given of the empirical response of plants in the brewing industry to sewer effluent charges (in particular estimates of conditional elasticities of response functions are given with respect to those charges). Also described are empirical responses of a representative firm in the brewing industry to pure effluent charges and sewer effluent charges. A pure effluent charge is one levied on discharges directly into a water body rather than into a sewer. Data used in the analysis were derived from study of the brewing industry in Canada. (Lynch-Wisconsin)
W79-01499

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 6B.
W79-01500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
C. Steiner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 671, Price codes: A08 in paper copy, A01 in microfiche. Thesis, Master of Science in Engineering, 1977. 149 p, 33 fig, 12 tab, 73 ref. (California Water Resources Center Project UCAL-WRC-W-518) OWRT A-062-CAL(1).

Descriptors: *Planning, *Model studies, *Water storage, *Reservoirs, *Aqueducts, Water quality, Water rates, Water demands, Seasonal, Water supply, Regional analysis, Storage capacity, Energy costs, Cost analysis, Marginal costs.

A multi-planning period cost minimizing model is presented for a large scale regional water storage and transport system in which (price insensitive) seasonal demands are assumed nondecreasing with time. The structure of the water system consists of 'collecting' reservoirs upstream at supply points, 'demand' reservoirs downstream at demand points and aqueducts linking them all. Mixed interger programming is used to minimize the sum over time of discounted costs of constructing and operating the aqueducts and reservoirs in the system so that seasonal demands are met. Major transport pumping costs are explicitly included assuming a seasonal electric power rate schedule. Optimal construction timing, sequencing, sizing and operating of the system components is computed in a framework which facilitates the trade-off of reservoir and aqueduct capacities where naturally occurring supplies and seasonal demands are timewise out of phase. Instream water quality requirements constitute environmental quality constraints on the quantity supply model. Under certain assumptions, demand constraint dual variables may be interpreted as seasonal marginal costs for bulk water supply. Use of these marginal costs as the basis for determining the seasonal price of bulk water is discussed. Parameterization of energy costs for pumping is used to derive season-specific water system demand curves for electric power. (Snyder - Calif, Davis)
W79-01002

RECONCILIATION OF APPARENT NONEQUIVALENCE AMONG ALTERNATIVE RATING METHODS,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 6B.
W79-01240

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W79-01242

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4D.
W79-01355

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
M. Hoel.
MIT Department of Economics, Working Paper No. 197, April 1977. 37 p, 7 fig, 3 tab, 22 ref. NSF SOC 75-14258.

Descriptors: *Resource extraction, *Costs, *Recycling, *Non-renewable resources, *Economics, *Resource substitution, Optimization, Model studies, Mathematical models, Environmental effects, Residuals, Waste disposal, Exhaustible resources.

A microeconomic partial analysis of the effect of environmental costs on optimal resource extraction includes the possibility of either recycling or a backstop technology able to produce a perfect resource substitute. This research emphasizes the effect of the cost of recycling or producing the substitute on resource extraction and development of harmful residuals or other negative environmental impacts. Resource extraction and recycling never take place simultaneously in the cases studied; at first only extraction takes place, with the optimal extraction rate declining over time. When recycling starts the rate is either constant or declining; in the latter case recycling approaches a stationary level, positive only if there is some natural degrading of harmful residuals. Because of environmental effects it may be preferable to leave part of a resource stock unextracted; but in any case the optimal path of extraction will be affected by the environmental effects. The stock of harmful residuals will usually be affected by recycling costs both in the long run and when resource extraction stops, true also for the initial growth of harmful residuals, determined by initial resource extraction. For most cases initial resource extraction and growth of harmful residuals increases inversely to the recycling cost. Though somewhat surprising, this result corresponds to the usual situation where initial extraction is higher the lower is the cost of producing a substitute. (Lynch-Wisconsin)
W79-01492

COMPUTERIZED COSTING MODEL FOR INLAND WATERWAYS BARGE TRANSPORTATION,
Missouri Univ., Rolla.
M. L. Smith, H. E. Metzner, and W. A. Brooks.
Interfaces, Vol. 8, No. 4, August 1978, p 31-37. 3 fig, 2 ref.

Descriptors: *Barges, *Inland waterways, *Computer models, *Cost analysis, *Transportation, *Economics, Costs, Alternative costs, Model studies, Analytical techniques, Optimization, Computer programs, Dedicated towing service, General towing service, Trucking, Railroads, Methodology.

A computer program is described which provides cost information on barge movements on the inland waterways system. The underlying model covers all aspects of barge costing: (1) linehaul costs, (2) terminal csts at the origin, and (3) destination, cargo insurance, and inventory expenses for both general and dedicated towing services. The costing program is currently being used by the Phillips Petroleum Company and the Missouri Pacific Railroad. The computerized system saves time (one day instead of 50-60 days for an average study) and cost (up to $20,000 per year) in generating data, and eliminates calculation errors. The barge cost optimization model calculates: (1) transit/terminal and interchange times, (2) towing costs for each towing service, (3) barge ownership costs, and (4) miscellaneous shipping costs. In each contemplated movement the shipper must weigh the total incurred cost for utilizing dedicated vs general towing service. If volume is sufficiently high, dedicated towing service often offers reduced barge ownership and towing costs on a distributed basis (per net ton), plus faster and more uniform round-trip times; volume insufficient for dedicated towing service should utilize general towing service. It is recommended that a total barge-incurred cost curve (illustrated) be constructed for varying amounts of tonnage in the vicinity of a shipper's anticipated annual tonnage. This model may be applicable to trucking and railroads as well as barges. (Lynch-Wisconsin)
W79-01493

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
G. C. Swanson, J. L. Seymour, and R. B. Ditton.
Coastal Zone Management Journal, Vol. 4, No. 1-2, 1978, p 25-45. 1 fig, 1 tab, 24 ref.

Descriptors: *Resource allocation, *Coastal zone management, *Political aspects, *Decision making, *Public sector, *Private sector, Common property, Coasts, Management, Coastal Zone Management Act, Shore protection, Beach erosion, Reefs, Artificial reef, Wetlands, Analytical techniques, Methodology, Governments.

Roles and responsibilities of the public and private sectors in coastal zone management are reevaluated, and an alternative mechanism for determining the proper use of the two sectors in common property resource allocation decision-making is presented. It is proposed that a 'sectoral responsibiligy analysis' be formally adopted at all levels of government to clarify where, when, and in what way government should act in coastal zone management. Instead of considering consumer utility as the criterion of agency effectiveness, bureaucratic institutions set up to handle such matters all too often assess performance on the basis of producer efficiency. Civil servants tend to substitute their priority schedules for the laws of the flawed free market as an allocation mechanism. The proposed analysis would include: (1) description of the present situation and problem (natural setting and processes, public-private interest and relationships); (2) relative strengths of the two sectors in their ability to cope with allocation decisions; (3) deficiencies of each sector in allocation ability; and (4) alternative mechanisms available to allocate resources with recognition of interrelationships. This paper contains: (1) a conceptual analysis of the relative strengths and weaknesses of the public and private sectors in resource decision-making, and (2) an examination of three examples of coastal resources management--beach and shorelands protection, artificial reefs, and coastal wetlands. (Lynch-Wisconsin).
W79-01494

RENEWABLE RESOURCE MANAGEMENT AND EXTINCTION,
British Columbia Univ., Vancouver. Dept. of Mathematics.
C. W. Clark, and G. R. Munro.
Journal of Environmental Economics and Management, Vol. 5, No. 2, June 1978, p 198-205, 2 fig, 10 ref.

Descriptors: *Renewable resources, *Optimization, *Extinction, *Economics, *Autonomous models, *Nonautonomous models, *Natural resources, Management, Model studies, Mathematical models, Discount rates, Equity, Policy, Marginal return, Marginal benefits.

Arguments supporting the proposition that extinction of a biological resource could be consistent with a policy of maximizing the discounted present value of economic rent have been based on models in which parameters are assumed to remain constant over time. This paper examines the consequences of relaxing this assumption, while retaining two other questionable ones: (1) that future parameter values, while not necessarily constant, are known with certainty; and (2) that questions of intergenerational equity are adequately represented by the usual present value criterion. Previous authors have held that a necessary and sufficient condition for the optimality of an extinction policy is simply that the own-rate-of-interest of the resource stock be less than the discount rate at all stock levels greater than zero. Since biological extinction is irreversible, such necessary and sufficient conditions are inadequate as they rest upon current information alone. Unfortunately, the own-rate-of-interest decision rule apparently has no simple extension to the general situation, and each case must be investigated on its own. In the nonautonomous case it is shown that extinction is never an optimal policy unless the marginal net return from harvesting the last unit of the resource exceeds the marginal net benefit to be enjoyed from conservation. This condition must be added to the necessary and sufficient conditions of the autonomous model, and it is often difficult to determine whether it has been satisfied. (Lynch-Wisconsin)
W79-01495

6B. Evaluation Process

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 3B.
W79-01063

CITIZEN PARTICIPATION FOR SUCCESSFUL VILLAGE WATER SUPPLY,
M. Elmendorf, and M. McGarry.
Civil Engineering, Vol. 148, No. 8, 68-70, August, 1978.

Descriptors: *Water supply, *Community development, *Water managemen(Applied), Water resources development, Water utilization, Water wells, Pipelines.

Developing countries which lack adequate supplies of safe drinking water need inexpensive water supply systems which can be easily maintained. Local participation in planning and building is the key for success in water management programs. An example of this is a water supply project in Santa Mario, Mexico. The villagers formed a water committee to collect money for the initial construction and continual maintenance of a well. Villagers were trained in drilling and well maintenance by WHO and UNICEF. The success of this project inspired another Mexican village to replicate it. In Malawi and Kenya, water piped from distant rivers has improved public health and the time and effort previously spent hauling water can now be spent more productively. Engineers can do the technical planning to solve water supply problems but the human element at the grassroots level must be included for effective utilization and management. (Purdin-NWWA)
W79-01112

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
For primary bibliographic entry see Field 4B.
W79-01117

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
D. F. Scott, and J. A. Leitch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 830, Price codes: A06 in paper copy, A01 in microfiche. North Dakota Water Resources Research Center, Research Project Technical Bulletin. August 1976. 119 p, 1 fig, 54 tab, 8 append. OWRT A-043-NDAK(1), 14-31-0001-5034.

Descriptors: *Watershed management, *Evaluation, *Economic impact, Flood damage, Flood control, Wetlands, Wildlife, Agriculture, *Alternative planning, *Devils Lake Basin(ND), *North Dakota.

An overview is provided of the Devils Lake Basin regional economy and the economics of alternative plans to reduce flood damages in the Basin are evaluated. Baseline data on employment, income, sales of selected sectors, and federal government outlays were collected from secondary sources. Two surveys of farm operators in the Basin were conducted to obtain information on flood damages, attitudes toward wetlands, and crop losses due to wildlife.
W79-01122

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

NON-RESIDENT HUNTERS--BENEFACTORS OR BAD MEN.
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch.
North Dakota Outdoors. Vol. 40, No. 2, p 19-21 August, 1977. OWRT B-034-NDAK(2), 14-34-0001-7127.

Descriptors: *Hunting, Big game, Small game, Waterfowl, Permits, Regulation, *Costs, *Recreation, *North Dakota, Devils Lake, Rugby.

The numbers and origins of non-resident hunters who came to North Dakota during the 1976 hunting season are analyzed. Some of the costs and regulations involved for non-resident hunters are discussed.
W79-01138

BUILDING PUBLIC/PRIVATE COOPERATION IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 6E.
W79-01145

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
G. A. Daneke.
Environmental Affairs, Vol 6, No 1, p 11-31, Winter, 1977.

Descriptors: *Alternative planning, *Project planning, *Decision making, *Planning, Non-structural alternatives, Administration, Programs, Comprehensive planning, Water law, Legal aspects.

Efforts to increase citizen involvement in environmental policy-making have been fragmented, even though public environmental concern has increased. Water resource policy could benefit by the participatory movement; planning and policy-making are decentralized, dependent upon local support and involvement, and water agencies have acquired standards and requirements for public decisional involvement. However, water development agencies have separated participation from planning, and have contacted the public only after completion of planning. The 1970 federal Flood Control Act instructed water resource agencies to consider the well being of a region's residents, and suggested that direct public input into regional planning should be instrumental. This prompted the U.S. Army Corps of Engineers to instruct its regional representatives to present information to the public to help define water resource priorities, develop input channels, provide structured opportunities for public influence, and promote coordination with other planning agencies. An innovative approach known as 'Fishbowl Planning' couples workshops and public meetings with citizen committees and feedback brochures. While this method has proved helpful, it isolates conflicting interest groups. Alternative procedures might produce greater public participation in the planning process. (Rule-Florida)
W79-01153

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W79-01167

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 851, Price codes: A06 in paper copy, A01 in microfiche. Report to the Congress by the Comptroller General of the United States, October 14, 1977, 98 p, 9 append.

Descriptors: *Tellico Dam(TN), *Cost-benefit analysis, *Tennessee Valley Authority, *Alternative planning, *Snail darter, *Environmental effects, *Little Tennessee River Valley(TN), *Endangered species, *River basin development, Legislation, Judicial decisions, Political constraints, Fish, Dam, Reservoirs, Tennessee, Land use, Agriculture, Sport fishing, Recreation, Legal aspects, Social values, Rivers, Valleys, Problem identification and ranking.

Issues in halting the Tennessee Valley Authority's nearly completed Tellico Dam project are reviewed; the U.S. General Accounting Office recommends that Congress should: (1) prohibit TVA from further work on the project, and (2) not exempt the project from the Endangered Species Act until more current information is received. The $116 million project, for which $103 million has been spent, was stopped January 1977 because it would harm or destroy the habitat of the snail darter, a small fish which has been found only in the Little Tennessee River near the proposed reservoir. It is here maintained that the problem of the snail darter (700 of which have been transplanted to the Hiwassee River) is only part of the broader issue of whether the Tellico project is the best use for the Little Tennessee River Valley. It is contended that alternative uses were not adequately considered by TVA, that the original cost-benefit data from 1968 is now out of date, and that TVA's analysis was based on faulty methodology. Such issues as archaelogical preservation, agricultural land use, trout populations, and a possible Scenic Rivers designation need to be evaluated. Costs and benefits that would arise if the dam is not completed are assessed, as well as legal and environmental considerations. TVA criticisms are responded to in an appendix. Abandonment of the project will require removal of part of the completed dam to protect the snail darter. (Lynch-Wisconsin)
W79-01193

RECONCILIATION OF APPARENT NONEQUIVALENCE AMONG ALTERNATIVE RATING METHODS,
California Univ., Berkeley. School of Public Health.
W. H. Bruvold.
Journal of Applied Psychology, Vol. 62, No. 1, p 111-115. 1977. 2 fig, 10 ref. (California Water Resources Center Project UCAL-WRC-W-359).

Descriptors: *Graphical methods, *Least squares method, Numerical analysis, Graphical analysis, Mathematical studies, Attitudes, Alternative rating methods, Measurement, Social values.

Past results showing nonequivalence between successive-intervals (representational) and category rating (index) measures are due to over-simplified graphical methods of successive-intervals analysis employed in previous studies. This proposition was tested using 107 subjects and 141 attitude items, and was confirmed, indicating that results from category rating and successive-intervals scales may be equivalent and that the former may have more research value than previously believed. (Snyder-Calif Davis)
W79-01240

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01313

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W79-01335

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and M. M. Hufschmidt.
Water and Sewage Works, p 40-41, December 1976. OWRT B-062-NJ(2). 14-31-0001-5134.

Descriptors: *Management, *Institutions, *Research priorities, *Urban runoff, *Water quality, Cities, Urbanization, *Urban water quality, *Urban-related water resources research, Urban hydrology, Research policy.

Findings and recommendations are presented of the water quality group of a workshop held at Quail Roost, N.C. to discuss reorientation of water resources research. The findings indicate that the costs of applying nationally applicable effluent standards nationwide would be out of proportion to the benefits obtained, that a new and more flexible planning strategy should be applied, that current areawide water quality planning is apt to be ineffective on account of lack of data and deficiency in technology relative to urban runoff pollution, that better methodology to integrate water supply and water pollution problems should be devised, and that institutional arrangements for pollution control require further investigation.
W79-01348

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
P. F. Senecal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 160, Price codes: A14 in paper copy, A01 in microfiche. Doctoral Dissertation, August 1977. 278 p, 208 fig, 5 tab, 109 ref. OWRT A-051-HI(1).

Descriptors: *Water resources, *Hawaii, *Water resources development, *History, Water supply, Confined water, Social aspects, Community development, Water demand, Population, Aesthetics, Parks, Landscaping, Architecture.

The social history of Oahu is presented from an environmental perspective with emphasis on water resource utulization on the island. The interaction of public administraton, technology, and aesthetics is discussed as the island community progressed from a rural to an urban environment. The history of the island's water supply is traced from the situation in 19th century Honolulu through the discovery and effect of artesian water to the formation of the Board of Water Supply. The decline of natural water features in two of Honolulu's important parks, Moanalua and Kapiolani, is examined and the quality and quantity of man-made water features in contemporary Honolulu and their role in the lives of residents is discussed. The discussion is illustrated by over 200 photographs of natural and architectural water-related sites. (Majtenyi-IPA)
W79-01353

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01359

QUANTIFICATION OF RECREATIONAL USE OF THE CORALVILLE RESERVOIR,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and R. Chen.
Available from the Technical Information Service, Springfield, VA as PB-288 947, Price codes: A04 in paper copy, A01 in microfiche. IIHR Report No. 185, March 1976. 48 p, 8 fig, 14 tab, 38 ref, 1 append. OWRT A-054-IA(5), 14-34-0001-6016.

Descriptors: *Multiple purpose reservoirs, *Iowa, *Recreation, *Estimating, *Water resources development, Water utilization, Project planning, Water demand, Human population, Forecasting, Reservoir operation, Fluctuations, Coralville Reservoir(Iowa), Operations research.

An attempt was made to estimate recreational use of the Coralville Reservoir near Iowa City, Iowa, for use in objective trade-off studies. A quantitative measure was derived from available data which is applicable for detrmining reservoir operation effects on an index of recreational use for the reservoir. This measure relates recreational use expressed in visitor-says, pool area, seasonal variations, and population of surrounding areas. This is not to be interpreted as a forecast of recreational demand but is intended to idicate operational effects on recreation use. Two limitations of the measur are that it was derived from existing operating rules in which reservoir pool elevation was mainted above minimum limits, and that it does not reflect the greater loss resulting from downward pool fluctuations. It is recommended that successive studies which use the value function derived in this investigation should also make explicit consideration of minimum pool and pool fluctuations during the recreation season. (Majtenyi-IPA)
W79-01361

ECONOMIC VALUE OF HUNTING, FISHING, AND GENERAL RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
W. E. Martin, and R. L. Gum.
Wildlife Society Bulletin, Vol. 6, No. 1, p 3-7, 1978. 3 tab, 6 ref.

Descriptors: *Arizona, *Economics, *Recreation, *Hunting, *Sport fishing, *Resources development, Land resources, Natural resources, Land management, Recreation demands, Competing uses, Water resources development, *Economic Value, *Revenue Value.

The basic interpretation of monetary values of natural resource areas for outdoor recreation is summarized. Then, based on a detailed study of recreation in Arizona, estimated monetary values for resource areas in use for hunting, fishing, and general rural outdoor recreation are presented. Two measures of monetary value are used-the total benefit value and the maximum collectable revenue value. Total benefits for deer hunting, general hunti, cold water fishing, warm water fishing, and all other general rural outdoor recration activities in Arizona in 1970 were estimated to be $243 illion. The maximum collectable revenue for these same acitivities would have been $87 million. As an illustration ofthe usefulness of these monetary value estimates, selected estimates are converted to values per square kilometer for comparison with values ofthe basic land when used for cattle production. For example, one square kilometer of huntable range in Manafement Region 5 had an average value of $229 in use for hunting, while the average sale value for cattle ranching was only $137. (EIS-Katz)
W79-01430

CONFERENCE PROCEEDINGS - A CRITICAL ECONOMIC BALANCE, WATER - LAND - ENERGY - PEOPLE - HELD AT COLORADO STATE UNIVERSITY, PINGREE PARK CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
P. Garrett, G. Kissinger, and J. Newlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 089, Price codes: A06 in paper copy, A01 in microfiche. Report FEA/77-8-6, June 1977. 105 p, 8 fig. Prepared for Federal Energy Administration, Region VIII, Lakewood, Colorado. P. Garrett, G. Kissinger, and J. Newlin (Editors).

Descriptors: *Energy, *Regional development, *Rocky Mountain Region, *Great Plains, *Southwest U.S., *Planning, *Natural resources, Environmental effects, Economics, Coals, Nuclear energy, Institutional constraints, Oil industry, Financing, Regional analysis, Regions, Land use, Policy, National Energy policy, Federal government, Forecasting, Management, Water supply, Land, Human resources, Agriculture, Environment, Solar energy, Geothermal energy.

A conference on the critical economic balance between water, land, energy, and people in the western states was held at Pingree Park, Colorado, 6-7 June 1977, sponsored by two Colorado-based agencies in cooperation with the Federal Energy Administration Region VIII. Objectives were to: (1) encourage regional coordination in the delivery of services and programs dealing with water, energy, land, and population growth; (2) stimulate analysis of issues, responsibilities, and directions for effective economic planning; and (3) develop recommendations for decision-makers in government, business, industry, and the public for achieving regional and national economic balance. Twelve papers deal with: (1) coordinated energy management, (2) the national energy plan, (3) legitimacy of western identity in an aconomic balance, (4) economic impact of water supply and demand, (5) regional implications of national energy-employment relations, (6) industry's role in energy management, (7) visualizing alternative futures for population growth and socio-economic balance, (8) issues in achieving an economic balance, (9) fragile lands and people, (10) private capital market, (11) planning and conservation in coal development and reclamation, and (12) goals for energy development. Background and economic concerns are given for Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, and numerous long- and short-term objectives identified by participants are listed. (See W79-01479 thru W79-01490) (Lynch-Wisconsin)
W79-01478

COORDINATED ENERGY MANAGEMENT,
Federal Energy Administration, Lakewood, CO. Socioeconomic Program and Data Collection Office.
P. G. Garrett.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977. Colorado State University, Pingree Park Campus. p 18-22.

Descriptors: *Energy, *Management, *Planning, *Decision making, *Policy, *Coals, *Natural resources, Government, Agriculture, Water, Water utilization, Water supply, Water demand, Political constraints, Water management, Rural areas, Economics, Economic development, Rocky Mountain Region, Great Plains, Southwest U.S.

A discussion of energy management, emphasizing western states included in Federal Energy Administration Region VIII, calls for cooperative and coordinative: (1) financial planning to ameliorate energy impact on rural areas; (2) technology assessment and decision-making strategies relative to the agricultural economy; and (3) multiple-purpose water management. The U.S. economy, and especially that of the western states, is critically dependent on energy employment. It is also dependent on the federal government de-emphasizing an advocacy relationship. This paper examines: (1) coal development and rural development, (2) agriculture, and (3) water. Negative effects of energy on a community associated with coal development range from those on revenue raising and expenditures to those on informal support systems and secondary employment networkds. Coordinated energy management is essential for policy analysis and implementation. Consideration should be given to administrative simplicity, flexibility, equity, risk minimization, timeliness, economic efficiency, and political feasibility. In the western states major industries and businesses are primarily agricultural or energy-related. Water used for increased energy production need not be lost to other water consumption demands. Multiple-purpose water management is necessary for coordinated energy management mechanisms. (See also W79-01478) (Lynch-Wisconsin)
W79-01479

THE NATIONAL ENERGY PLAN,
Federal Energy Administration, Lakewood, CO. Region VIII.
D. E. Faver.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Campus. p 22-26.

Descriptors: *Energy, *Planning, *Policy, *Federal government, *Oil, *Costs, *Natural resources, Department of Energy, National Energy Policy, Demand, Conservation, Imports, Coals, Solar energy, Geothermal energy, Nuclear energy, Natural gas.

The Carter Administration has taken two approaches to the problem of energy supply: (1) creation of a Department of Energy to coordinate effort and centralize responsibility, and (2) submission to Congress of a national energy policy. The latter includes several basic components: (1) reducing annual growth of energy demand to under 2%; (2) reduction of oil and gas imports from 16 million barrels/day to six million barrels; (3) shifting from oil to coal use by increasing coal production more than 60%; (4) increasing total annual U.S. energy production from the present 660 million tons to over one billion tons by 2985; (5) reducing gasoline consumption by 10%; (6) insulating 90% of residences and other buildings; and (7) installing solar energy systems in over 2.5 million homes. The underlying objective is to distribute evenly the real cost of energy in BTUs, whether from natural gas, coal, petroleum, or other source. The cornerstone of the policy is conservation--saving energy, eliminating waste, and efficient energy use. Oil and gas are speculative energy sources. Coal is of great current importance, and nuclear power should be strongly considered. Solar and geothermal energy have much potential, but are not immediately available in sufficiently large quantities. (See also W79-01478) (Lynch-Wisconsin)
W79-01480

LEGITIMACY OF WESTERN IDENTITY IN AN ECONOMIC BALANCE WATER - LAND - ENERGY - PEOPLE,
Federation of Rocky Mountain States, Denver, CO. Western States Energy Policy Office.
P. Burgess.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977. Colorado State University, Pingree Park Campus. p 27-31.

Descriptors: *Multi-state institutions, *Regional economics, *Western governors policy office, *Institutional constraints, *Planning, *Natural resources, *Regional development, Regional analysis, Regions, Research and development, Institutions, Water, Energy, Land, Economics, Policy, Rocky Mountain Region, Great Plains, Southwest U.S.

A conference paper which describes recent reorganizational events among multi-state institutions in the western states of the Federal Energy Administration's Region VIII, concludes that regional or multi-state institutions are most valuable in providing economies of scale or divisions of labor, and

much less for the few genuine regional problems. the 15-state Western Governors' Task Force on Regional Policy Management, brought together at the National Governors' Conference (July 1976), later investigated proliferation of multi-state institutions in the western states, and their ability to deal with water, energy, and environmetal concerns. Over 100 multi-state institutions were identified, 40% in natural resources, 20% in human resources, 12% in agriculture, and the rest in telecommunications, transportation, and the like. The Western Governors' Policy Office is to replace several other institutions, including the Western Governors Regional Energy Policy Office and the Western Federation of Rocky Mountain States; it also incorporates activities of the Western Interstate Nuclear Compact. The Governors serve as board of directors, and will have an interim board called the Regional Coordinating Council with policy offices in energy, agriculture, natural resources, human resources, and water. (Lynch-Wisconsin)
W79-01481

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
K. Kauffman.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 32-38.

Descriptors: *Water demand, *Water supply, *Economic impact, *Energy, *Water policy, *Federal government, *Water resources development, *Water allocation(Policy), *Natural resources, Rocky Mountain States, Great Plains, Southwest U.S., Water conservation, Economic development, Economics, River basins, Colorado River Basin, Missouri River Basin, Water consumption(Except consumptive use), Policy, Regional development, Water rights.

The role of water in national economic development is discussed, with special attention to energy and to the federal government's water policy. The discussion focuses on western states of the Federal Energy Administration'S Region VIII. In the upper and lower Colorado River basin water will probably limit energy development, but not in the upper Missouri River basin. Average annual water supply in the upper Colorado basin is about 5.8 million acre-feet, of which 3.7 million is actually consumed, leaving only 2.1 million for additional development. Estimated water demand for the year 2000 is over 2.5 million acre-feet of additional water, for energy, municipal and industrial use, agriculture, fish and wildlife, and recreation. The upper Missouri basin has an annual flow of 28 million acre-feet, of which only six million is used. The era of major federally funded water development in the United States is ending; federal water planning will now focus on national economic development, environmental quality and water conservation. Regional development has ceased to be sanctioned as a national water resources policy objective. At the National Water Conference Secretary of the Interior Andrus indicated that nonstructural water planning and management measures will have equal status with structural ones, non-federal entities will be required to bear a larger share of project costs, and water allocation practices will be reviewed and revised. (See also W79-01478) (Lynch-Wisconsin)
W79-01482

REGIONAL - IMPLICATIONS - OVERVIEW OF NATIONAL ENERGY EMPLOYMENT RELATIONS,
Department of Labor, Washington, DC. Office of the Under Secretary.
W. Nordlund.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus, p 38-41.

Descriptors: *Regional development, *Employment, *Energy, *National Energy Plan, *Policy, *Human resources, *Natural resources, Rocky Mountain States, Great Plains, Southwest U.S., Federal government, Political constraints, Social overhead, Coals, Employment opportunities.

Employment aspects of the Nationall Energy Plan are discussed with emphsis on the western states. Direct employment in the energy sector represents about 2% of the labor force (about two million workers). Although there are some seven million unemployed in the U.S., most have neither the skill nor experience required for an expanded energy work force. In addition, the unemployed tend to be located in large metropolitan areas, while energy jobs usually occur in nonurban areas. Rapid expansion of 'boom towns' in the Rocky Mountain region due to energy development has been accompanied by inadequate roads, schools, hospitals, water supply, sewers, and tax base, and high job turnover and employee absenteeism. Project delays, falling productivity, and rising production costs often follow. There is typically an inverse relationship between unemploymet and job turnover. The Department of Labor can do little to alleviate such problems, apart from providing information, training, and motivation seminars. Aspects of the National Energy Plan which will affect employment in the West include: (1) large-scale coal development; (2) transportation of 400-500 MTPY of coal; (3) impact of power plant construction and coal mine operation on worker turnover, productivity, and absenteeism; and (84) major flows of new workers into the region. (See also W79-01478) (Lynch-Wisconsin)
W79-01483

THE INDUSTRY'S ROLE IN ENERGY MANAGEMENT,
Peabody Coal Co., Denver, CO. Regional Counsel's Office.
D. Sturges.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Campus. p 42-55.

Descriptors: *Industries, *Energy, *Coals, *Policy, *Management, *Strip mines, *Coal mines, *Natural resources, Air pollution, Rocky Mountain Region, Great Plains, Southwest U.S., Federal government, Regional development, Environmental effects, Planning, Social aspects, Economics.

Past, present and future roles and problems of industry in energy management are discussed. The analysis is from the prespective of the coal strip mining industry in the western states. Energy companies at the current state of development should: (1) make full and open disclosures of energy development plans, including measures for minimizing effects on the environment; and (2) participate earlier at all levels of public policy development, to help establish appropriate legal and institutional mechanisms. Industry traditionally has responded to market forces, rather than controlling them; it finds coal, determines its quality, assembles the land package, extracts the coal, and markets it. Most environmetal and socio-economic impact research for permit applications is contracted to outside firms, and is not done within the industry. In the past, industry has not been an initiator or innovator in public policy-making institutions or processes, reacting instead to proposed or current public policies. Industry has generally stimulated employment and public revenue, but has not participated with public agencies in management of socio-economic consequences. Western coal is primarily federal coal; the real land/coal ownership pattern is a checkerboard of federal coal interspersed with private or fee-coal. Problems facing the industry include permit delays, capital formation, coal leasing, air pollution control, salinity control, and public opposition to operations at various mining sites. (See also W79-01478) (Lynch-Wisconsin)
W79-01484

POPULATION GROWTH AND SOCIO-ECONOMIC BALANCE: HOW TO VISUALIZE ALTERNATIVE FUTURES,
Colorado Univ., Boulder. Dept. of Sociology.
E. Boulding.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 56-63. 8 fig.

Descriptors: *Human population, *Human resources, *Alternative planning, *Future planning(Projected), *Rocky Mountain Region, *Forecasting, *Energy, *Natural resources, Delphi technique, Analytical techniques, Trend projections, Colorado, Coal mines, Coals, Community development, Agriculture, Employment.

Methods of visualizing future impact of energy development on human development are described, and population trends for the Rocky Mountain region are discussed. A slow-down energy development scenario is suggested, allowing for a generation-length time lag, which would provide fully for human development and human welfare. It emphasizes diversified development of a wider range of energy resources for the western region, offers an alternative to boom town/ghost town cycles, and responds to current changes in life style preferences away from dependence on high technology and toward less complex, more labor-intensive ways of life. The scenario embodies a possible pattern of energy development which might begin with an extensive increase in local farming where intensive energy development is planned and population increase will be rapid. By protecting agricultural and family garden land, coal companies could enhance rather than destroy the quality of a community, and mine productivity would be positively affected. A wider variety of energy sources should be utilized, including wind and other solar sources, and women should be included in the work force to minimize social disruption and maximize efficiency. Population statistics generally do not indicate alarming densities, though trend lines are now relatively steep. Colorado (and other states) should double in population by the year 2000. Average growth trends mask sudden growth in specific areas, which pose serious problems. (See also W79-01478) (Lynch-Wisconsin)
W79-01485

CRITIQUE OF THE CHALLENGES,
Yuma Soil Conservation District, AZ.
M. Mekelburg.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 64-66.

Descriptors: *Research priorities, *Economic development, *Regional development, *Goals, *Natural resources, Agriculture, Energy, Cost allocation, Colorado, Planning, Solar energy, Institutional constraints.

Several issues of importance in evaluating the economic balance between land, water, people, and energy are identified and discussed briefly. They include intergovernmental communication, regional planning, costs and spending priorities, agriculture, the need for development of solar energy, soil and water conservation, energy, food production, government responsibility, cost allocation, energy production from grain (such as gasohol), water rights. For the forseeable future, food production will outweigh all other issues, including energy. If agriculture is not responsive to water conservation needs, some regulations will be necessary. Colorado ranks high among states receiving federal funding for soil and water conservation, but is nearly at the bottom in achievement. Solar energy could be very effectively applied to agriculture, especially in grain elevators. (See also W79-01478) (Lynch-Wisconsin)
W79-01486

FRAGILE LANDS AND PEOPLE,
Colorado State Univ., Fort Collins. Dept. of Politi-

cal Science.
N. Wengert.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 67-72.

Descriptors: *Land use, *Land, *Planning, *Rocky Mountain Region, *Great Plains, *Environment, *Natural resources, Southwest U.S., Policy, Human resources, Colorado, Urbanization, Air pollution, Water pollution, Mountain forests, Lumbering, Ecology, Mining, Agriculture, Strip mines, Natural resources.

The fragility of the western natural environment requires specialized kinds of research and poses special problems for land use planning. Land in Colorado and much of the West is fragile both in its natural state and with use by people. In both cases fragility carries with it high risk, uncertainty, and slow recovery from natural or man-induced intrusions. In their natural state the plains were subject to buffalo overgrazing, drought, blowing dust, grasshoppers, prairie fires, and forest fires. Man's uses, such as for dry-land wheat production, probably has not generally increased the hazards, though mismanagement has contributed to deterioration and depletion of particular areas. Some land management practices have in fact minimized these hazards and improved resources; examples are water spreading on range land and fire suppression in forests and grasslands. Nevertheless, management affects ecology in often-overlooked ways, such as fire prevention's effect on species succession among trees. The critical factor in the area's natural fragility is lack of water, which hinders strip mine reclamation and high plains agriculture. Ghost towns resulting from mining occur because alternatives to mineral exploitation were not considered. National Forests in the Rocky Mountains will be de-emphasizing lumbering under new legislation. Air and water pollution in cities is qualified by environmental factors such as altitude and streamflow variations. (See also W79-01478) (Lynch-Wisconsin)
W79-01487

VIEWPOINT FROM THE CAPITAL MARKET,
Webber (Walter) and Associates, Boulder, CO.
W. Webber.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 73-76.

Descriptors: *Capital supply, *Economics, *Financing, *Regional development, *Electric power production, *Natural resources, Yampa Project, Capital, Loans, Colorado, Grants, Private capital market, Electric powerplants.

Increasing quantities of capital will become necessary in the future to accomodate the nation's energy development. This paper discusses capital availability in the private market and its use in cooperative ventures which bring together the public and private sectors of the economy. Private capital formation in the U.S. is currently very satisfactory, and is more than adequate to meet demand. The western states have produced very little institutionalized capital, and sources must generally be found outside this region. The capital market views the West as a region of great profit potential. Two large projects illustrate private capital in combination with funding from federal and local government: (1) the Yampa Project, a large $700 million coal-fired electric generating station at Craig, Colorado; and (2) a $1.4 billion electrical project involving two Rural Electrification Administration (REA) cooperatives, a South Dakota power district, the city of Lincoln, Nebraska, and an association of 65 cities in Minnesota, Iowa, and South Dakota. The Yampa Project will carry power to five states, and involve two REA cooperatives, an Arizona agriculture and irrigation district, four Colorado cities, and the U.S. Bureau of Reclamation. Funding is through the Bureau of Reclamation, REA loans and bonds for the cooperatives share, and bonds for the shares of the other participants. Funding for the second project is through the Federal Finance Bank, the Bank for Cooperatives, and municipal bond market. (See also W79-01478) (Lynch-Wisconsin)
W79-01488

COAL DEVELOPMENT AND RECLAMATION - PLANNING AND CONSERVATION,
Grace (W. R.) and Co., Dallas, TX. Mining Div.
C. Margolf.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 77-82.

Descriptors: *Coal mines, *Conservation, *Reclamation, *Permits, *Institutional constraints, *Environmental effects, *Natural resources, Coals, Colorado, Colowyo Coal Company, Oil shales, Planning, Economics, Lake DeSmet(WY), Wyoming, Regulation.

This paper recounts the frustrations of W. R. Grace Company's Colowyo Coal Company Project (near Craig, Colorado) in obtaining a mining permit, and comments generally on environmental planning and energy development. Colowyo applied to the U. S. Geological Survey for a permit in July 1974, which has still not been granted. The permit application process is very cumbersome and time-consuming at the federal level, and additional regulations are required at the state and local levels. Although the surface land is owned by the company, the coal is federal coal, and thus the permit is necessary. The mining industry in 200 years has disturbed just under six million acres, of which about two thirds has either been reclaimed by the company or healed by nature. By contrast, 300 million acres have been disturbed by agriculture, and 30 million for airport, railway, and highway right-of-ways. The author cites examples where man has purportedly improved upon nature, such as Lake DeSmet, Wyoming, which was naturally a chemical cesspool before a diversion ditch was built to bring water into the basin. It is stated that there is merit to the environmental ethic, and that a mining company can do more to improve the environment than what nature accomplished before the mine was begun. (See also W79-01478) (Lynch-Wisconsin)
W79-01489

CRITIQUE AND CHALLENGES,
Energy Research and Development Administration, San Francisco, CA. Consumer Affairs. CA.
R. Vallera.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 83-86.

Descriptors: *Goals, *Research priorities, *Energy, *Economics, *Environment, *Institutional constraints, *Natural resources, Solar energy, Coals, Geothermal energy, Nuclear energy, Planning.

Environmental, economic, energy, and societal needs are interrelated and of equal importance. The nation must seek to create a public climate in which realistic environmental and economic alternatives can be debated, cooperation can be achieved, and mutual efforts can be directed to issue-solving. Nuclear energy and coal are available now, and must be used. There is a loan guarantee for geothermal energy, but not for solar energy development; both must be considered potential sources of energy, but not currently available ones. In such states as California, regulations and the inversion layer preclude use of coal, and make use of nuclear energy imperative. It is important that there be dialogue among bureaucrats at all levels of government, state, local and federal. Elitism must be avoided. Communication is likewise necessary between government and the constituency. (See also W79-01478) (Lynch-Wisconsin)
W79-01490

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
E. F. Denison.
Brookings General Series Reprint 335, 1978. 22p, 15 tab. NSF 75-23131.

Descriptors: *Economic effects, *Input-output analysis, *Pollution abatement, *National income, *Safety factors, *Crime, Economics, Human resources, Environment, Regulation, Standards, Water pollution control, Air pollution, Mining, Automobiles, Costs, Institutional constraints, Legislation, Governments, Economic growth.

Effects on national income (or net national product) of three major cost factors are assessed: (1) new requirements to protect the physical environment against pollution, (2) increased requirements to protect the safety and health of employees, and (3) a rise in dishonesty and crime among employees, customers, and the public. The analysis focuses on the period from about 1967 to 1975. In 1975 output per unit of input in the nonresidentialbusiness sector of the economy was 1.8% smaller than it would have been if business had operated under 1967 conditions. Of that amount, 1.0% can be ascribed to pollution abatement, 0.4% to employee safety and health programs, and 0.4% to the increase in dishonesty and crime. Output shrank minimally in 1968-70, but rapidly in the 1970s. Output per unit of input fell 0.2% between 1972 and 1973, 0.4% between 1973 and 1974, and 0.5% between 1974 and 1975. A reduction of 0.5% in annual growth rate is nearly one-fourth of the total annual growth rate of output per unit of input 1948-69 (2.1%)., and almost one-fifth of the growth rate of output per person employed (2.6%). This article is not intended as a criticism of the wisdom of government programs, but as an analysis of growth and productivity. Many costs occasioned by the three factors do not reduce output per unit of input, and a major part of this study was separating out such costs. This paper is part of a broader study of th sources of economic growht, which will update a previous publication covering 1929-69. (Lynch-Wisconsin)
W79-01491

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W79-01498

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
M. N. Neufeld, M. Sittenfield, M. J. Plotkin, K. F. Wolk, and R. E. Boyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 205, Price codes: A09 in paper copy, A01 in microfiche. Publication No. EPA-560/6-77-033, AAI 2378/2379-101-FR-1, October 1977. 171 p, 16 fig, 42 tab, 106 ref. EPA 68-01-1996.

Descriptors: *Input-output analysis, *Vinylidene chloride, *Pollutants, *Industrial production, *Polymers, *Water pollution sources, Air pollution, Carcinogens, Public health, Markets, Effluents, Saran, Polyvinyl chloride, Polyvinylidene chloride, Industries, Chemical industry, Monomers, Landfills, Sewage lagoons, Waste disposal, Industrial wastes, Vinyl chloride.

A detailed study of the production, consumption, and losses to the environment of vinylidene chloride (VDC) and its important derivatives and polymers was prompted by its structural similarities to vinyl chloride, which in the early 1970s was found to be carcinogenic at relatively low concentrations (20 ppm) for chronic exposures. The toxicology of VDC and polyvinylidene chloride (PVDC) and related impact on human health are outside the scope of this report. Topics covered are: (1) current manufacturing sites and processes for VDC,

(2) shipping and handling practices, (3) production markets, (4) environmental management during production, (5) consumption processes and sites, (6) environmental management of the monomer in consumption processes, and (7) consumption markets. Although structurally similar to vinyl chloride, VDC is shown to have significantly different physical and chemical properties. Of 135 million lbs of VDC monomer input to polymer production facilities in 1976, about 560,000 lbs were lost directly to the atmosphere and 7.8 million labs were lost in the form of solid or latex emulsion disposed of in sewerage ponds or landfills. Converting processes are notoriously wasteful, with 15-50% of input packaging materials normally lost to landfills or incinerators. The 26 million lbs thus wasted at the converting level are estimated to contain less than 200 lbs of VDC monomer (2.5 ppm). (Lynch-Wisconsin)
W79-01500

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01193

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W79-01194

EQUITABLE RECOVERY OF INDUSTRIAL WASTE TREATMENT COSTS IN MUNICIPAL SYSTEMS, FEDERAL GUIDELINES.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
For primary bibliographic entry see Field 5D.
W79-01206

THE INDUSTRY'S ROLE IN ENERGY MANAGEMENT,
Peabody Coal Co., Denver, CO. Regional Counsel's Office.
For primary bibliographic entry see Field 6B.
W79-01484

VIEWPOINT FROM THE CAPITAL MARKET,
Webber (Walter) and Associates, Boulder, CO.
For primary bibliographic entry see Field 6B.
W79-01488

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W79-01492

COMPUTERIZED COSTING MODEL FOR INLAND WATERWAYS BARGE TRANSPORTATION,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 6A.
W79-01493

RENEWABLE RESOURCE MANAGEMENT AND EXTINCTION,
British Columbia Univ., Vancouver. Dept. of Mathematics.
For primary bibliographic entry see Field 6A.
W79-01495

A NOTE ON THE USE OF TAXES TO CONTROL POLLUTION,
Southampton Univ. (England).
For primary bibliographic entry see Field 5G.
W79-01496

THE 'STANDARDS AND PRICE' APPROACH TO POLLUTION CONTROL: PROBLEMS OF ITERATION,
Newcastle-upon-Tyne Univ. (England).
For primary bibliographic entry see Field 5G.
W79-01497

THE RESPONSE OF FIRMS TO POLLUTION CHARGES,
Concordia Univ., Montreal (Quebec).
For primary bibliographic entry see Field 5G.
W79-01499

6D. Water Demand

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
For primary bibliographic entry see Field 4B.
W79-01117

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
For primary bibliographic entry see Field 5F.
W79-01311

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01312

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01359

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
R. L. Whitehead.
Idaho Department Water Resources(Boise), Water Information Bulletin No 46, May 1978. 91 p, 17 fig, 15 tab, 36 ref.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Water demand, Recration facilities, Water supply, Aquifer characteristics, Water yield, Water level fluctuations, Reservoirs, Lakes, Surface-groundwater relationships, *Rainfall-runoff relationships, Data collections, Evaluation, *Idaho, *Snake River Plain(Idaho), *Upper Henrys Fork basin(Idaho).

Upper Henrys Fork basin, Comprising 1, 070 square miles in eastern Idaho and a small area in western Wyoming, has a permanent population of about 1,500. Ashton is the major population center. Because the area attracts thousands of summer vacationers and winter sports enthusiasts, related land- and water-use pressures are increasing. Surface water is stored inHenrys Lake and island park Reservoir for irrigation outside the basin. Ground water is used chiefly for municipal, domestic, and stock supplies. Volcanic rocks and alluvium compose most of the aquifer materials. permeable volcanic rocks in the eastern part of te basin greatly influence water yields and ground-water movement between subbasins. Data suggest that movement across the basin boundary is minimal . Mean annual precipitation on the basin is estimated to be about 35 inches, of which about 50 percent contributes to the mean annual discharge in Henrys Fork near Ashton, which is 1,441 cubic feet per second, or about 18 inches. This represents the discharge form the basin, except for that lost to evapotranspiration. Annual mean discharge of streams generally varies directly with the annual mean precipitation. Water quality in the basin is generally excellent. Although, in the Ashton area and in areas of intermittent high usage by man, some deterioration of the quality is evident. Values for specific conductance range from less than 100 to about 300 micromhos per centimeter at25 C, except in the Ahston area where as much as 800 micromhos was measured in the ground water. (Woodard-USGS)
W79-01364

WATER-QUALITY INDICES FOR SPECIFIC WATER USES,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-01381

COORDINATED ENERGY MANAGEMENT,
Federal Energy Administration, Lakewood, CO. Socioeconomic Program and Data Collection Office.
For primary bibliographic entry see Field 6B.
W79-01479

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W79-01482

POPULATION GROWTH AND SOCIO-ECONOMIC BALANCE: HOW TO VISUALIZE ALTERNATIVE FUTURES,
Colorado Univ., Boulder. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W79-01485

6E. Water Law and Institutions

THE ORDINARY HIGH WATER MARK: ATTEMPTS AT SETTLING AN UNSETTLED BOUNDARY LINE,
Spessard L. Holland Law Center, Gainesville, FL.
F. E. Maloney.
Land and Water Law Review, Vol. XIII, No. 2, p 1-35, 1978. 208 ref. OWRT B-030-FLA(1), 14-34-0001-7113.

Descriptors: *Water resources development, *Legislation, *Judicial decisions, *Planning, *Legal aspects, *Water pollution, Flood plain zoning, Riparian rights, Permits, Administration, Prior appropriation, Civil law, Regulation, Boundaries, Public rights.

The ordinary high water line is typically defined as the boundary between privately-owned riparian uplands and publicly-owned lands beneath non-tidal navigable waters. Considered are the definition of the ordinary high water line, the question of whether federal common law controls the definition of the line, the use of the meander line as an alternative boundary, the necessity of an ambulatory line, and the question of whether a definition based on statistical averaging would be legally valid. (Morgan-Florida)
W79-01009

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-01105

GROUNDWATER LAW: MORE QUESTIONS THAN ANSWERS,
W. Wieking.
Pacific Groundwater Digest, Vol. 1, No. 1, p 35-36, September, 1978. Reprinted from Western Water-July/August Issue.

Descriptors: *Water law, *Water rights, *Ground water, *California, Prior appropriation, Riparian rights, Beneficial use, Reasonable use, Wildlife conservation, Water utilization.

The Governor's Commission to Review California Water Rights Law will soon release recommendations for changes in ground water rights laws. The present law is the result of a number of important court cases. There is no comprehensive set of ground water laws. A landowner is allowed to use as much water as he wants if it is beneficial. This results in overuse and danger of ground water each year or 2.2 million acre-feet more than the annual recharge rate. The usable ground water storage capacity is approximately 143 million acre-feet. The uncertainty involved in determining the amount of groundwater in storage and the rate of recharge is an obstacle in many court cases. This could be overcome by having local or state agencies conduct detailed hydrogeologic studies and keep up-to-date records. Some feel that appropriative rights prevent the equitable distribution of water and promote overuse of water. Conservationists are concerned that current water rights law does not adequately consider the water needs of fish and wildlife. While many water authorities advocate change, others argue that tampering with the system will create more problems than it will solve. (Purdin-NWWA)
W79-01118

RIPARIAN RIGHTS UNDER THE TEXAS WATER RIGHTS ADJUDICATION ACT - A CONSTITUTION ANALYSIS,
S. L. Golden.
Saint Mary's Law Journal, Vol 9, No 1, p 87-101, 1977.

Descriptors: *Riparian rights, *Constitutional law, *Natural resources, *Beneficial use, *Texas, Riparian water, Legislation, Water rights, Conservation, Properties, Appropriation, Eminent domain, Reasonable use, Legal aspects, Prior appropriation, Domestic water, Public rights, Usufructuary rights, Compensation.

In 1967, the Texas Water Rights Adjudication Act was passed pursuant to constitutional mandate that the legislature enact laws for the development, control, preservation, and conservation of the state's natural resources. The parts of the Act affecting riparian rights are examined in this article with emphasis placed on whether or not those provisions result in unconstitutional expropriations of real property. The Act provides for limitation of the riparian owner's rights by recognizing those rights only to the extent that they are applied to beneficial use, thus abrogating prior vested riparian rights to all reasonable uses of the water. The Legislature claims the Act is within the police power of the state. Others contend that riparian rights are vested property rights which are constitutionally protected from expropriation without compensation. The article examines similar acts passed by several other western states. Several of these acts have been held constitutional while others have been found to be unconstitutional. The author concludes that because riparian rights in Texas have long been recognized as a property right in the nature of a right in the land itself, the Act is unconstitutional in permitting expropriation, as opposed to appropriation, of vested property rights. (Spector-Florida)
W79-01140

THE FOX IN THE CHICKEN COOP: THE REGULATORY PROGRAM OF THE U.S. ARMY CORPS OF ENGINEERS,
Maryland Univ., Baltimore. School of Law.
G. Power.
Virginia Law Review, Vol 63, No 4, p 503-59, 1977.

Descriptors: *Regulation, *Administrative agencies, *Federal government, *Navigable waters, Governments, Legislation, Permits, Water policy, Institutions, Administrative costs, Administrative decisions, Decision making, Institutional constraints, Governmental interrelations, Political aspects, Rivers and Harbors Act, Judicial decisions, Law enforcement, Federal Water Pollution Control Act, Federal jurisdiction.

In recent years, the Army Corps of Engineers (Corps) has had an expanding role in the regulation of navigable waterways. This expanding role has changed the Corps from a permissive overseer of private activities to a defender of the environment. The Corps first gained regulatory powers via the Rivers and Harbors Act of 1899. This gave the Secretary of War (later Army) the power to license all dredging and filling activities. Discharge of refuse into waters was also prohibited without a permit from the Corps. Changing judicial and administrative interpretation of the Act has resulted in it being more literally and stringently enforced today than in the past. The Corps' territorial jurisdiction has been expanded by court decisions which interpret the term 'navigable waters' in the Federal Water Pollution Control Act to include all waters of the United States. As a result of these changes and institutional constraints, the Corps' program today does not work in the public interest as a moderator of coastal development. Current permit procedures are better designed to veto projects than expedite them. The program is in need of Congressional reform because it discourages development, beneficial or not. (Malefatto-Florida)
W79-01141

THE LEGALIZATION OF GROUNDWATER SHORTAGE,
Southern California Metropolitan Water District, Los Angeles.
V. E. Gleason.
Water Resources Bulletin, Vol 14, No 3, June 1978, p 532-41.

Descriptors: *California, *Underground storage, *Aquifer management, *Water rights, Judicial decisions, Water storage, Administrative agencies, Taxes, Overlying proprietor, Groundwater resources, Future planning(Projected), Competing uses.

Courts are only now starting to discuss and create an explicit groundwater storage right. Communities have traditionally relied on aquifer storage programs. Recently, however, these programs have become large, sophisticated, and expensive--thus fostering increased judicial concern. Established aquifer storage programs, operating under specific legal authority, have dealt with protection of groundwater rights, not with storage rights. The forms taken have been local agency acts tailored to fit unique situations of areas overlying each aquifer, and judicial regulation under a water rights adjudication. The storing agencies usually do not extract water themselves. All operations would be financed by imposing ad valorem taxes and, in some cases, 'pump taxes'. Legal ambiguities are involved in the aquifer storage concept. Two such ambiguities involve the relationship between aquifer storage and conventional property interests. The first interest is that of the overlying landowner, the second is the water rights owner's interest in using the groundwater within the aquifer. Many reasons exist for extending California's judicial recognition of aquifer storage rights to other states. Increasing pressures to use natural resources efficiently should be particularly persuasive. (Spiegel-Florida)
W79-01142

INDIANS AND THE ENVIRONMENT: AN EXAMINATION OF JURISDICTIONAL ISSUES RELATIVE TO ENVIRONMENTAL MANAGEMENT,
George Washington Univ., Washington, DC. National Law Center.
F. Schnidman.
Columbia Journal of Environmental Law, Vol 4, No 1, p 1-34, Fall, 1977.

Descriptors: *Indian reservation, *Jurisdiction, *Resource development, *Water rights, Environmental control, Federal government, State governments, Local governments, Land use, Water quality, Energy, Exploitation.

Jurisdiction over Indian lands in the United States has frequently been contested by states, the federal government and Indian tribes. The most pressing issues appear to be: (1) the extent of permissible Indian initiative to define, regulate and monitor resource management on Indian lands; (2) interplay between federal regulatory programs and state and tribal jurisdictional conflicts; and (3) the role of state police power over Indian lands. This article explores the historical aspects of the tribal, federal and state jurisdictional claims over Indians and their land. An examination of state administration of environmental management programs on Indian lands follows the first section. The final section is devoted to a proposal of an intergovernmental mechanism to deal with the use, protection, preservation and enhancement of the finite resources on Indian lands. The author concludes that existing federal policies favor Indian governmental and economic independence. In addition, bitter court fights have resulted in a deterioration of relations between states and Indians. Negotiation of Indian-state conflicts should be utilized when available. Also, states should seriously consider promotion of national policies favoring Indian self-determination and independence. (Quarles-Florida)
W79-01143

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
For primary bibliographic entry see Field 5G.
W79-01144

BUILDING PUBLIC/PRIVATE COOPERATION IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. T. Kildow, D. Kramer, L. Newhouse, and K. Barrington.
Single copies of this article available from NTIS-JACS. Massachusetts, *Coastal engineering, *Industries, *Comprehensive planning, Coastal plains, Coastal marshes, Coastal structures, Energy, Legislation, Wetlands, Analysis, Future planning(Projected).

It is assumed that cooperation between private industry and the public sector is necessary for an effective coastal zone management plan in Massachusetts. This will allow planners and managers to develop a plan responsive to public environmental concerns and also sensitive to industry's needs. This research is designed to test the validity of this assumption, and also to inquire into the interests, characteristics, goals, needs and behavior patterns of private businesses as they interact with state agencies on environmental issues--particularly those relating to the coastal zone. Patterns for communication between public agencies and private businesses are identified with recommendations for incorporating them into a coastal zone program. The research focuses on outcomes of private-public interaction. Indications of the value of the various types of interaction are implicit in the study. The report consists of: (1) examinations of the Coastal Zone Management Act, of the activities of the Massachusetts Office of Coastal Zone Management, and federal constraints upon those activities; (2) case studies; (3) analysis of the assumptions of the study; and (4) conclusions about private-public interaction and their application to Massachusetts Office of Coastal Zone Management activities. (Quarles-Florida)
W79-01145

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-01146

PROPOSED (GUIDELINE MODEL) COASTAL AND RIVERINE FLOOD PLAIN ZONING ORDINANCE,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 6F.
W79-01147

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
For primary bibliographic entry see Field 6F.
W79-01148

A CONSTITUTION FOR THE OCEANS: COMMENTS AND SUGGESTIONS REGARDING PART XI OF THE INFORMAL COMPOSITE NEGOTIATING TEXT,
Center for the Study of Democratic Institutions, Santa Barbara, CA.
E. M. Borghese.
San Diego Law Review, Vol 15, No 3, p 371-408, 1978. Appendix.

Descriptors: *Law of the sea, *United Nations, *Conferences, *Negotiations, Oceans, Exploitation, Technology, Research and development, Economics, Treaties, Evaluation, Ownership of beds.

The Informal Composite Negotiating Text is the result of the Sixth Session of the United Nation Conference on the Law of the Sea. This article critically examines the provisions of Part 11 of the Text. The author explores the relationship between the Law of the Sea and efforts of developing nations to restructure the world political and economic system. There is a detailed critique of the present negotiating text draft. Suggestions are made for reforming the draft to accommodate the quest of developing countries for a new world economic order. The author suggests that the Law of the Sea will continue its development in the context of the emergence of a new international order. The Text is a unique document which the international community is not accustomed to dealing with. Whatever the document's imperfections are, its adoption is not yet complete. Additional changes may be made before its final approval, if that point is ever reached. The article includes an appendix with an individual comparison of each subject in each of the three different texts on the Regime for the Deep Seabed considered at the Conference. (Quarles-Florida)
W79-01149

FEDERAL COMMON LAW AND OCEAN POLLUTION: A PRIVATE REMEDY FOR OIL POLLUTION DAMAGE,
For primary bibliographic entry see Field 5G.
W79-01150

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
For primary bibliographic entry see Field 5G.
W79-01151

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 5G.
W79-01152

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6B.

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
For primary bibliographic entry see Field 5G.
W79-01154

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
For primary bibliographic entry see Field 5G.
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
For primary bibliographic entry see Field 5G.
W79-01156

SHOULD THE LAW OF THE SEA CONFERENCE BE SAVED,
National Security Council, Washington, DC. Public Advisory Committee on the Law of the Sea.
M. L. Dickey.
International Lawyer, Vol 12, No 1, p 1-19, Winter, 1978.

Descriptors: *United Nations, *Oceans, *Conferences, *Negotiations, International waters, Mining, Treaties, Fisheries, Exploration, Natural resources, Ownership of beds.

The sixth session of the United Nations' Law of the Sea Conference recently came to a close. The results of the latest session were inconclusive at best. Another session is scheduled for Spring, 1977. Another result is an 'Informal Composite Negotiating Text' which is a revision of two previous drafts of 303 article on ocean issues. These issues include: ocean floor mining, pollution control, passage through straits, and new jurisdictional claims. The current session failed to make any significant breakthrough in major areas of disagreement. This article explores the realistic possibility of the conference ultimately succeeding. Some critics claim that a treaty agreed upon by the majority could be far worse than no treaty at all. Others insist the absence of a treaty would lead to a mad territorial scramble. The United States representative called the result of the latest session so fundamentally unacceptable on the issue of seabed mining as to require him to recommend a review of United States' interests in the continued negotiations. The author concludes that no acceptable treaty will be adopted unless one is formulated at the next session. (Quarles-Florida)
W79-01157

SEABED RESOURCES AND INTERNATIONAL LAW,
International Inst. for Environment and Development, Washington, DC.
R. Stein, and I. Walter.
Resources Policy, Vol 3, No 4, p 237-42, 1977.

Descriptors: *Law of the sea, *Resource allocation, *Oceans, *Exploitation, United nations, Technology, Jurisdiction, Mineral industry, Oil, International law, Resources development, Ownership of beds.

World population growth, along with advanced technology and dwindling resources, has raised the prospective value of the sea as an economic resource. This article explores the problems related to the exploitation and allocation of undersea resources. The nature and accessibility of undersea petroleum supplies and metalliferous nodules are described in terms of the existing and prospective future economic constraints. Ownership of these resources has recently generated international conflict since most resources lie outside national jurisdiction. The character of the conflict is explained, and the prospective solution under international law are identified. The most probable solution [illegible] tries possessing the requisite technology to exploit these resources. However, this solution may not satisfy many aspects of international equity. Undersea minerals recovery is predicted to dominate the future economics of international resources. The United Nations Conference on the Law of the Sea has so far failed to adopt any major resolution on these issues. If the Conference does not succeed, it is probable that intergovernmental agreements will arise among technically advanced countries. Developing countries can only hope for some minimal agreement to emerge from the Conference. (Quarles-Florida)
W79-01158

THERMAL DISCHARGES AND POWER PLANT INTAKES: SECTION 316 IN PERSPECTIVE,
For primary bibliographic entry see Field 5G.
W79-01159

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5G.
W79-01160

UP TO OUR WASTES IN WET SUITS: THE FEDERAL LAW ON WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W79-01161

A COMPARISON OF BETHLEHEM STEEL CORP V. TRAIN WITH REPUBLIC STEEL CORP. V. TRAIN: THE SIXTH CIRCUIT,
For primary bibliographic entry see Field 5G.
W79-01162

IN SEARCH OF COMMON NODULES AT UNCLOS III,
Virginia Univ., Charlottesville. School of Law.
J. N. Moore.
Virginia Journal of International Law, Vol 18, No 1, p 1-15, Fall, 1977. 1 tab.

Descriptors: *Oceans, *United Nations, *Exploitation, *Ownership of beds, Mining, Treaties, International waters, Law of the sea, Navigation, Resources development, Natural resources, Beds under water.

For more than two years, the Third United Nations Conference on the Law of the Sea (UNCLOS 3) has been achieving notoriety. The issue given so much attention is the legal order for deep seabed mining. It cannot be predicted when seabeds will be tamed. However, when the time arrives, it will enhance utilization of ocean resources, protection of shared interests in navigational freedom, improved protection for the ocean environment, and reduction in political tensions. It may even lay the groundwork for a successful North-South detente. Participants in UNCLOS 3 should recognize their achievements, yet realistically understand the difficulty they face in concluding a comprehensive law of the sea agreement. Focus should be placed on the deep seabed impasse, while unresolved non-seabed issues cannot be neglected. A 'unitary joint-venture' system between developing and developed countries may cause substantial problems. Not only will developed nations be able to dominate the Enterprise under any plan acceptable to them, but the system in general would be very rigid and restrictive. A 'balanced development system', with separate benefits for both developed and developing nations, would be more successful and more equitable. (Spiegel-Florida)
W79-01163

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-01165

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
For primary bibliographic entry see Field 5G.
W79-01166

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W79-01167

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield. 1978. 216 p.

Descriptors: *Illinois, *Legislation, *Water resources, *Regulation, Surface waters, Administrative agencies, Drainage, Canals, Channels, Rivers, Lakes, Recreation.

There has been an increased public interest in the use of the rivers, lakes and streams of Illinois. Included in this graving concern have been numerous requests for information regarding statutes pertaining to this subject. Due to this increased awareness, the Illinois Department of Transportation (DOT), published a list of statutes dealing with rivers, lakes, and streams. Those statutes pertinent to the DOT's authority, duties, and jurisdiction, as well as to the authority of the DOT's Division of Water Resources, are included. Statutes have been placed under 17 headings, including plats, parks, nuisances, state government, counties, and local government. The two areas receiving the most coverage are 'canals and waterways' and 'drainage'. The statutes are listed by number and situated next to their respective titles. Each statute is copied verbatim from the Illinois Revised Statutes, 1977 State Bar Association Edition. No commentary is included. Reference to decisions of the Illinois Supreme Court and Appellate Courts construing any of these laws may be found by examining the Smith-Hurd Illinois Statutes under the chapters and sections cited herein. (Spiegel-Florida)
W79-01168

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 6, NEW ORLEANS, LA.).
Hearing, Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, June 27, 1977, Serial No. 95-H25, 446 p.

Descriptors: *Federal government, *Federal Water Pollution Control Act, *Water pollution, *Evaluation, Legislation, Permits, Regulations, Toxins, Wetlands, Water pollution control, Political aspects, Water policy.

The subcommittee on Environmental Pollution, under the auspices of the United States Senate's Committee on Environment and Public Works, held a series of hearings in June, 1977. The subject of the hearings was the 1977 Federal Water Pollution Control Act Amendments. Subcommittee chairperson was Sen. Edmund Muskie, from Maine. In Sen. John Culver's opening address, he admonished mankind for its failure to preserve the natural resources which provide the necessities of life. Stressing the critical need to protect this nation's water, he described how Congress passed the 1972 Federal Water Pollution Control Act Amendments. George Anderson, of the Brunswick Pulp Land Company, addressed the subcommittee on possible legislative effects on the forest products industry. Anderson contended that section 404 was a case of over-kill in its methods of providing protection for wetlands. B. L. Deberry, Director of Texas' Department of Highways and Public Transportation, urged the repeal of legislation requiring permits for dredge and fill operations for highway and transportation facility construction. Many witnesses were called to discuss the discharge of toxic pollutants and the provisions of the Clean Water Act which protects wetlands. All witness testimony is provided. (Spiegel-Florida)
W79-01169

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 7, BURLINGTON, VT.).
Hearing, Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, July 9, 1977, Serial No 95-H25, 226 p.

Descriptors: *Vermont, *Waste water treatment, *Federal water pollution control act, Alternative planning, Legislation, Local government, Sewage treatment, Recharge ponds, Groundwater recharge, Water quality standards, Evaluation.

The Subcommittee on Environmental Pollution is a sub-group of the United States Senate's Environment and Public Works Committee. A hearing was held to discuss amendments to the Federal Water Pollution Control Act (FWPCA). The issues discussed by the witnesses related to problems small rural communities face in complying with FWPCA waste treatment standards and alternatives to conventional secondary treatment plants. Basically, the conventional plants are too expensive for small communities. An example of alternatives is found in the testimony of Michele Frome, from the Vermont Natural Resources Council, who testified that on-site septic systems are a viable, permanent solution for small communities. Another witness discusses problems with household/on-site facilities and proposed methods to lower the cost of municipal wastewater treatment systems. Other witnesses included representatives of the Vermont Department of Highways and the state's Agency of Environmental Concern. There were numerous other witnesses. The Brookhaven National Laboratory submitted a detailed report on an experimental Marsh/Pond sewage recharge system, the purpose of which is to develop a natural system to continuously renovate sewage to groundwater rechargeable quality. All witness testimony is included in original form. (Horwich-Florida)
W79-01170

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 9, WASHINGTON, D.C.).
Hearings, Subcomm. on Environmental Pollution, Committee on Environment and Public Works, U.S. Senate, June 28, 29, 30 and July 1, 1977, Serial No 95-H25, 725 p.

Descriptors: *Federal water pollution control act, *Water pollution control, *Evaluation analysis, Federal government, Administrative agencies, Water pollution treatment, Water law, Environmental control, Industrial water, Comprehensive planning, Water quality standards.

Hearings before the Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works continue in Washington, D.C. The purpose of these hearings is to consider what changes, if any, are necessary in the 1972 Federal Water Pollution Control Act Amendments (Act). The text includes the testimony of many witnesses offering their opinions on this matter. The witnesses include representatives of environmental groups as well as spokesmen for various industrial and developmental interests. A spokesman for the Edison Electric Institute expressed concern that all future increments of progress should be carefully examined to make sure that benefits received are worth the cost to the American consumer. The Natural Resources Defense Council's spokeman felt that additional staff and enforcement authority are necessary for the federal Environmental Protection Agency to meet its reponsibilities under the Act. The representative of the American Iron and Steel Institute appeared before the committee to ask for more time to meet the ambitious standards set by the Act. The spokesman for the Project on Clean Water urged that virtually no changes be made in the Act. (Quarles-Florida)
W79-01171

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (APPENDIX, STATEMENTS SUBMITTED FOR THE RECORD).
Hearings, Subcomm. on Environmental Pollution, Committee on Environmental and Public Works, U.S. Senate, Part 10, Serial No 95-H25, 1977, 952 p.

Descriptors: *Federal water pollution control act, *Legislation, *Federal government, Regulation, Water pollution, Pollution abatement, Water quality, Public utilities, Environment, Water policy.

The subcommittee on Environmental Pollution is a sub-group of the United States Senate's Committee on Environment and Public Works. Hearings were held before the subcommittee to discuss Federal Water Pollution Control Act Amendments (FWPCA) of 1977. Senator Edmund Muskie, of Maine, was chairperson for the subcommittee. In this appendix lies statements made by witnesses who appeared before the subcommittee. All statements were submitted for and made a part of the record. Among those submitting statements were the Resident Commissioner from Puerto Rico, spokesman for the Water Pollution Control Federation, the Scott Paper Company, the American Farm Bureau Federation, and numerous other organizations. Topics discussed covered a broad spectrum although the basis of each statement were the FWPCA amendments. Unintended consequences resulting from the amendments were described by the president of the Puerto Rico Manufacturers' Association. The Canners League of California gave testimony as to why certain laws should not be applied to members of their industry. The National Association of Realtors urged prohibition of controlling growth through a sewage treatment construction grant program. Many other groups testified, on diverse subjects. All are included in this appendix. (Spiegel-Florida)
W79-01172

OIL POLLUTION LIABILITY.
Hearings, Subcomm. on Coast Guard and Navigation, Comm. on Merchant Marine and Fisheries, U.S. House of Reps., February 24 and 25, March 10 and 23, 1977, Serial No 95-2, 217 p.

Descriptors: *Legislation, *Oil spills, *Federal government, *Evaluation, Oil pollution, Regulation, Navigation, Fisheries, Water pollution, Disasters, Compensation.

In February, 1977, hearings were held before the Subcommittee on Coast Guard and Navigation, under the direction of the United States House of Representatives Committee on Merchant Marine and Fisheries. The topic discussed at the hearings was oil pollution liability. More specifically, bills were discussed which had been formulated to provide a comprehensive system of liability and compensation for oilspill damage and removal costs. Mario Biaggi, Representative from New York was chairperson. In his opening remarks, Rep. Biaggi emphasized that the pending legislation was being considered against a background of numerous recent oilspill incidents. Rep. Biaggi claimed one such bill, H.R. 3711, was being formulated to accomplish three goals: to establish rights and liabilities of persons affected by, or involved in, an oil pollution incident; to provide an efficient recovery system for injured parties; and to eliminate conflicting laws so that compensation procedures would be centralized. Numerous witnesses, including representatives of insurance companies, the environmental community, and the American Trucking Association, were recognized to discuss this and other pieces of proposed legislation. All witness testimony is included. (Spiegel-Florida)
W79-01173

WATER CONTAMINATION BY TOXIC POLLUTANTS: AN ASSESSMENT OF REGULATION,
Library of Congress, Washington, DC. Div. of Environment and Natural Resources Policy.
J. E. Blodgett, C. A. Musgrove, and M. E. A. Reisch.
Prepared for the Subcommittee on Investigations and Review of the Committee on Public Works and Transportation, U.S. House of Representatives, Publication No 95-26, Sept 1977, 81 p.

Descriptors: *Toxins, *Water pollution control, *Regulation, *Water policy, Legislation, Administrative decisions, Federal water pollution control act, Water quality, Federal government, Evaluation, Analysis, Pollutants.

Waters are contaminated by basically two broad categories of pollutants. One is made up of degradable waste products, which natural systems can assimilate or degrade with proper management. The other category is composed of toxic pollutants, which present more complex pollution control problems. Included in the toxic category are such contaminants as heavy metals, pesticides, industrial chemicals such as PCB's, and carcinogenic chlorinated hydrocarbons. Several federal pollution control laws deal with toxic substances, including the Federal Water Pollution Control Act, the Marine Protection, Research and Sanctuaries Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Toxic Substances Control Act. How each of these statutes function with respect to toxics, as well as the major problems which have been encountered with their enforcement, is outlined in this assessment paper. Policy issues discussed include: the need for comprehensive pollution control; sufficiency of existing control strategies; party liability and compensation; and the fragmentation and coordination of administrative functions. The two basic questions raised in the paper's conclusion concern implementation of existing statutes and whether more legislation is needed to fill gaps in existing toxic substance control law. (Malefatto-Florida)
W79-01174

LITTLE RIVER, IOWA, WATERSHED PROJECT.
Hearings-Subcomm. on Water Resources, Comm. on Public Works and Transportation, U.S. House of Representatives, November 29, 1977, 8 pages. Publication No 95-41.

Descriptors: *Iowa, *Water resources development, *Water management(Applied), *Watershed management, Water supply development, Water utilization, Engineering structures, Flood protection, Flood control, Water control, Dams, Project planning.

The Little River, Iowa, watershed project of the Soil Conservation Service--a project for flood prevention, erosion control, and municipal water supply--was considered by the U.S. House of Representatives Subcommittee on Water Resources. Testimony of the Assistant Administrator of Water Resources, and representatives of the Soil Conservation Service and the U.S. Department of Agriculture, indicated that the proposed project would reduce runoff, erosion and sediment in the watershed, and greatly reduce the annual floodwater and gully erosion damage in the area. Additionally, Iowa Rep. Tom Harkin stated that the use of the main reservoir as a municipal and rural water supply source was underestimated and that ground water supplies in southern Iowa were of poor quality and limited quantity. Thus, the survival of small towns and the continued agricultural productivity of the area were dependent upon authorization of the project. In response to a request by the federal Environmental Protection Agency, the quality of water entering the reservoir would be monitored for one year before installation of a dam. If the water was of sufficiently poor quality, the water supply purpose could be deleted from the project. (Rule-Florida)
W79-01175

STATUS REPORT ON LAW OF THE SEA CONFERENCE.
Hearing, Subcomm. on Public Lands and Resources, Comm. on Energy and Natural Resources, U.S. Senate, July 26, 1977, 30 p, Publication No 95-62.

Descriptors: *United Nations, *Ownership of beds, *Law of the sea, *Conferences, International waters, Oceans, Surface waters, Mining, Exploration, Exploitation, Negotiations, Analysis.

The status report of the Sixth Session of the Third United Nations Law of the Sea Conference was presented to the Subcommittee on Public Lands and Resources, of the U.S. Senate's Committee on Energy and Natural Resources. Compromises resulting from negotiations during the Conference were significant to the United States, particularly regarding the legal status of the economic zone. The right of a coastal state to withhold its consent to marine scientific research was limited, as was a provision which would have allowed a coastal state to prevent publication of scientific research results. However, provisions completely unacceptable the United States were included in the seabed test. These provisions do not provide reasonable assurance of access to the deep seabed, and seem to give the Seabed Authority the power to regulate scientific research in the deep seabed. These provisions were so unacceptable as to make the entire treaty inadequate for the protection and advancement of United States' interests. The decision of whether it would be worthwhile to attempt further negotiations depends on how important the treaty is to the United States and whether a process could be found that offers an adequate basis for United States' participation in seabed mining. (Rule-Florida)
W79-01176

INCLUSION OF ALASKA LANDS IN NATIONAL PARK, FOREST, WILDLIFE REFUGE, AND WILD AND SCENIC RIVERS SYSTEMS (PART II, WASHINGTON, D.C.).
Hearings, Subcomm. on General Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Representatives, April 25 and 28, 1977, 383 p, Serial No 95-16.

Descriptors: *Alaska, *Legislation, *Federal government, *Conservation, Land use, National parks, Forests, Preservation, Wildlife conservation, Rivers, Internal water, Water resources development.

Hearings were held before the Subcommittee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic discussed was the conclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H.R. 39, H.R. 1974, H.R. 2876, and H.R. 5505 et al. These proposed bills dealt with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1454 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, H.R. 5605 and H.R. 8651 concerned establishing the Admiralty Island National Preserve in Alaska. Buff Bohlen, representing the federal Department of the Interior, was one witness. He urged adoption of the proposed legislation, noting that there was no conflict between the need for parks and the national need for energy and minerals. Bohlen also saw the proposed as being consistent with principles of sound land use management. Various other witnesses, including many conservationists, spoke at the hearings. All witness tesimony is provided. (Spiegel-Florida)
W79-01177

INCLUSION OF ALASKA LANDS IN NATL. PARK, FOREST, WILDLIFE REFUGE, AND WILD AND SCENIC RIVERS SYSTEMS (PART V, ATLANTA, GA.).
Hearings, Subcomm. on Gen. Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Rep., May 14, 1977, Serial No 95-16, 242 p.

Descriptors: *Alaska, *Legislation, *Federal government, *Conservation, Land use, National parks, Forests, Preservation, Wildlife conservation, Water resources development, Internal water, Rivers.

Hearings were held before the Subcommittee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic discussed was the inclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H.R. 39, H.R. 1974, H.R. 2876, and H.R. 5505, et al. These proposed bills dealt with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1454 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, H.R. 5605 and H.R. 8651 concerned establishing Admiralty Island National Preserve in Alaska. Statements were made by various witnesses at the hearings. Louise Franklin and Dr. Bob Pedigo both urged adoption of the legislation in order to preserve an entire ecosystem for future generations. Rep. Wyche Fowler, from Georgia, also encouraged speedy adoption of the legislation, as did many of the witnesses. All witness testimony is given. (Spiegel-Florida)
W79-01178

INCLUSION OF ALASKA LANDS IN NATL. PARK, FOREST WILDLIFE REFUGE AND WILD AND SCENIC RIVERS SYSTEMS (PART XII, FAIRBANKS, ALASKA).
Hearings, Subcomm on Gen. Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Reps., Aug. 20 1977, Serial No. 95-16, 577 p.

Descriptors: *Alaska , Legislation, *Federal government, *Conservation, Land use, National parks Forests, Preservation, Wildlife conservation, Water resources development, Internal water, Rivers.

Hearings were held before the subcommittee committee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic dicussed was the inclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H. R. 39, H. R. 1974, H. R. 2876, andH. R. 5505 et al. These proposed bills deal with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1954 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, concerned establishing Admiralty Island national Preserve in Alaska. Two witnesses, Jeff Kraebel and Rudolph Vetter, opposed passage of the legislation because of its potential effect on mining. Both felt that vital minerals would never be brought to the surface if they were buried beneath protected lands. The Governor of Alaska urged that title to the lands in question be given to tha Alaskan people. Many private citizens spoke at the hearings. Al witness testimony is provided. (Spiegel-Florida)
W79-01179

INCLUSION OF ALASKA LANDS IN NATIONAL PARK, FOREST, WILDLIFE REFUGE, AND WILD SCENIC RIVERS SYSTEMS (PART XIII, ALASKA TOWN MEETINGS),
Hearings, Subcomm. on General Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Reps.. August 8-19, 1977, Serial No. 95-16, 665 p.

Descriptors: *Alaska, *Land classification, *Legislation, *Conservation, Fishing, Wildlife, Rivers, Wetlands, Water rights, Social impact, National parks, Internal water.

Hearings were held by the Subcommittee on General Oversignt and Alaska lands, of the U.S. House of Representatives' Interior and Insular Affaris Committee. John Seiberling presided. Discussed was the inclusion of Alaskan lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. Several native Alaskans and representatives of the Association of Village Council Presidents (A.V.C.P.), among others, testified as to the possible effects of the proposed bill. Many indicated they would prefer wildlife refuge status because federal management proposes to be more favorable to their subsistence way of life than does the present state regulation system. For example, protection of hunting and fishing rights, with preferential treatment of subsistence hunters. Two A.V.C.P. complaints with the bill were: (1) that motor vehicles (snowmobiles, powerboats, airplanes), which have become an integral part of the subsistence way of life, should be permitted to be used; and (2) that no special protection against use by outsiders is offered for waters to be classified as 'wild and scenic rivers'. Morris Udall, Committee chairman, assured the A.V.C.P. representatives that the bill would be written in such a way as to protect subsistence lifestyles. All witness testimony is provided. (Horwich-Florida)
W79-01180

MEEKER V. CITY OF CLINTON (FLOOD DAMAGES CAUSED BY MUNICIPAL AND RAILROAD NEGLIGENCE),
259 N. W. 2d 822-33 (Iowa 1977).

Descriptors: *Iowa, *Flood damage, *Railroads, *Watersheds(Basins), Cities, Civil engineering, Damages, Bridges, Floods, Dams, Flood control, Judicial decisions, Sewers, Rain, Storm water, Urban drainage, Drainage systems, Ditches, Negligence.

Plaintiff homeowners brought suit against city and railroad to recover damages sustained in a flood which was allegedly caused by defendants' negligence in failing to remove debris from creek and ditch. Plaintiffs claimed that defendants allowed debris to build up in areas and around structures under their control. This debris was alleged to have acted as a dam thereby causing the flood. The defendant city denied that it had any duty to keep the creek in a proper condition. Both defendants contended that they did not breach any duty to keep the creek and ditch in good repair, and they further submitted that their negligence, if any, was not the proximate cause of plaintiffs injury. The Supreme Court of down held that in the absence of evidence that there was debris in the creek or ditch at the time of the flood or that debris caused the flood on the grounds that defendants negligently failed to remove debris from the creek or ditch. The only evidence presented showed that excessive rain caused the flood. (Jordan-Florida)
W79-01181

OAK LEAF COUNTRY CLUB, INC. V. WILSON (FLOOD DAMAGE CAUSED BY CHANNELIZATION),
257 N.W. 2d 739-48 (Iowa 1977).

Descriptors: *Iowa, *Channel improvement, *Flood damage, *Erosion, *Silting, Abrasion, Alteration of flow, Bank erosion, Accelerated erosion, Deposition(Sediment), Damages, Diversion, Drainage, Drainage effects, Sedimentation, Streamflow, Running waters, Topography, Floods.

Plaintiffs, owners of land located immediately below defendant's farm, alleged that defendat's straightening of the Black Hawk Creek altered it's natural course and accelerated the velocity of the current which caused increased scouring and abrasion to the creek banks as well as increased flooding. The action was alleged to have damage plaintiffs' land through deposits of sand, silt and extensive erosion, Defendant denied these allegations, and also raised as an affirmative defense plaintiffs' failure to mitigate damages by their failure to stabilize the banks of the creek. The trial court granted defendants' motion for directed verdict on the grounds that the evidence was insufficient to carry the issue of liability to a jury and plaintiff appealed. The Supreme Court of Iowa reversed and held that although plaintiffs were required to introduce evidence showing the after effects of floods were different subsequent to the channelization project, there was sufficient evidence introduced from which a jury could infer that defendant acted unreasonably in straightening the channel in such a way as to harm plaintiff. One must exercise ordinary care inthe use of his property so as not to injure the rights of neighboring landowners. (Jordan-Florida)
W79-01182

STATE WATERS-GENERAL PROVISIONS.
N.D. Cen. Code Ann. secs 61-01-03 thru -23 (1960), as amended (Supp. 1977); secs 61-01-24 thru -26 (Supp. 1977).

Descriptors: *North Dakota, *Legislation, *Water policy, *Water resources development, Water law, Permits, Regulation, State jurisdiction, Drainage programs, Legal aspects, Comprehensive planning, Management.

Chapter 61-01 of the North Dakot
W79-01183

MATTER OF THE WATERS OF LONG VALLEY CREEK SYSTEM (PROSPECTIVE RIPARIAN RIGHTS CANNOT BE DENIED OR QUANTIFIED BY STATE WATER RESOURCES BOARD),
148 Cal. Rptr. 488-93 (Ct. App. 1978).

Descriptors: *California, *Riparian rights, *Beneficial use, *Administrative decisions, Irrigation, Streams, Water rights, Water supply, Water users, Water utilization, Resource allocation, Constitutional law.

Nine claimants sought statutory adjudication of water rights by the State (California) Water Resources Control Board. Appellant, a private landowner, claimed prospective riparian rights for land he had not previously irrigated. The Board limited Appellant's rights to use for the land previously irrigated, because the area water supply was limited. The state Superior Court upheld the order. On appeal, the landowner argued that riparian rights are vested and cannot be lost or quantified because of non-use. Appellant also alternatively contended that prior litigation among the claimants was precluded by prior litigation. The court sustained these contentions and reversed the lower court decision, holding that a riaprian owner's water rights, unlike those of an appropriator's do not depend upon resent use. Further, state Water Code section 2769 was declared unconstitutional to the extent that it requires quantification of prospective riparian rights. However, the trial court may determine whether the proposed new use is a reasonable beneficial use and, if so, the quantity required and allocated for such use. (Horwich-Florida)
W79-01184

RIGHT TO CONSTRUCT DAMS AND RAISE WATER-CONDUCTING WATER OVER LANDS AND RAILROAD RIGHTS OF WAY,
Mont. Rev. Code sec 89-820 (1947).

Descriptors: *Montana, *Dam construction, *Right-of-way, *Railroads, *Beneficial use, Reservoir construction, Embankments, Water rights, Legal aspects, Compensation, Ditches, Conveyance structures, Flumes, Water conveyance, Legislation.

The right to conduct water from or over the land of another for any beneficial use includes several rights. The water may be raised by means of dams, reservoirs or embankments to make it useful for the intended purpose. The land necessary for this may be acquired upon payment of just compensation as provided by law for the taking of private property for a public use. If it is necessary to conduct water across the right of way of any railroad, the owners of the ditch or flume must give the owner of the railroad thirty days notice, in writing, or their intent to construct a ditch or flume across the right of way of such railroad, of its location and of the time of construction. If the owner of the railroad fails to appear and attend at the time and place fixed in this notice, the owner of the ditch or flume may lawfully contruct the ditch or flume without further notice. (Beamer-Florida)
W79-01185

RULES AND PROCEDURE FOR COASTAL CONSTRUCTION AND EXCAVATION.
Florida Dept. of Natural Resources, Tallahassee. Div. of Marine Resources.
Fla. Admin. Code, Ch 16B-25, secs 25.01 thru 25.09 (1978).

Descriptors: *Florida, *Coastal structures, *Evacuation, *Regulation, Natural resources, Legislation, Administrative agencies, Structures, Beaches, Dunes, Sea walls.

Florida Statutes, Section 161.052 and 161.053, are implemented by this rule of the Florida Department of Natural Resources (DNR). The rule established the requirements and procedures relating to: (1) coastal construction; (2) the processing of requests for variances and related conditions; and (3) other activities seaward of a setback line. Ther is a general prohibition against making any excavation or placing any structure seaward of the setback line except as provided by the aforementioned statutes. There is also a general prohibition against: (1) removal of any beach material; (2) alteration of existing ground elevation; (3) driving any vehicle on any sand dune; or (4) damaging any sand dune or vegetation thereon. Certain exemptions are provided for minor, temporary excavations and certain repairs to existing structures. Any person wishing to obtain a variance from the DNR must submit an application to the Bureau of Beaches and Shores. The application must include, among other items: (1) a topogrphic survey; (2) description and reasons for the work; (3) name, address, and telephone number of the appicant;(84) ev 84) evidence of legal ownership of the land; and (5) assurance that no local setback ordinance will be violated by the proposed project. (Quarles-Florida)
W79-01186

BOND STREET AND WEATHERBEST SLIP BOATHOUSE OWNERS V. CITY OF NORTH TONAWANDA (CITY MAY NOT TERMINATE WATER SERVICE TO A CUSTOMER IN GOOD STANDING).
404 N.Y.S. 2d 463-64 (1978).

Descriptors: *Sewage disposal, *Adjudication procedure, *New York, *Municipal water, Water pollution sources, Water pollution control, Water policy, Pollution abatement, Water quality standard, Public health, Sewage treatment, Leases.

Appellant tenants of respondent city occupied boathouses on city owned riverfront property. Appellants connected city water service to the boathouses at their own expense. In 1973, the Niagra County Health Department determined that raw sewage was being discharged into public waterways from these boathouses, and ordered the city to abate the conditions. Attmpting to comply, the city changed its leases to forbid the use of boathouse property as temporary or permanent residences. Any violation of such condition would automatically terminate the lease. The pollution continued, and in 1976 the city terminated the water supply to the boathouses. Appellants brought this action to compel the city to supply water for as long as they paid the proper charges. The court held that the city could not terminate appellants' water supply because a consumer who has been provided with water and paid their taxes has an implied contract for continued service so long as the consumer pays their bills. Legal eviction proceedings or the installation of sewer systems were suggested as appropriate remedies by the court. (Stump-Florida)
W79-01187

METALLIC MINING RECLAMATION ACT,

Wisc. Stat. Ann. secs 144.80 thru 144.94 (Supp 1977).

Descriptors: *Wisconsin, *Mining, *Reclamation, *Environmental control, Metals, Legislation, Mineral industry, Permits, Regulation, Standards, Water quality control.

The purpose of Wisconsin Metallic Mining Reclamation Act (Act) is to provide that the air, lands, waters, fish and wildlife affected by prospecting or mining in the state will receive the greatest practicable degree of protection and reclamation. A mine reclamation council serves as a problem solving body to work as a liaison between the department and the metallic mining industry. The department is to serve as the central unit of state government in carrying out the purpose of the Act. The department duties include: (1) the establishment of rules setting minimum qualifications for applicants for prospecting and mining permits; (2) the adoption of minimum standards for prospecting, mining, and reclamation; and (3) the development of a comprehensive program of mineral resources zoning and financial incentives. The procedure for obtaning mining prospecting permits is set forth. No one may engage in these activities without a permit. Posting of bond by the mining operator is required. Modifications of a permit may be allowed upon application. Sanctions and enforcement of the Act against noncomplying operators are provided. (Quarles-Florida)
W79-01188

CITY OF BERKELY V. SUPERIOR COURT FOR THE COUNTY OF ALAMEDA (ADDITIONAL ADJUDICATION ISSUES NEED TO DETERMINE IF LAND SUBJECT TO PUBLIC 'TIDELAND TRUST'),
147 Cal. Rptr. 113-25 (Ct. App. 1978).

Descriptors: *California, *Public lands, *Land resources, *Shores, State government, Ownership of beds, Tidal waters, Marshes, Bays, Public benefits, Navigation, Fishing.

A conflict arose regarding public versus private ownership of a tract of land located on the shoreline of the San Francisco Bay. The principle issue was whether the disputed tract was held subject to a 'tideland trust'. When California was admitted to the Union it assumed ownership of certain tidelands which it held in trust for public purposes of navigation, commerce, and fishing--thus the term 'tideland trust'. The city of Berkely and the state claimed the trust continued to exist while the Santa Fe Land Improvement Company claimed to win the land in question. Santa Fe argued that pursuant to two legislative acts, the land had been conveyed by the state 'free of the public trust for commerce, navigation and fishing'. On this issue, the court concluded that the titles conveyed to private parties were subject to the tideland trust. However, the court did not rule on all issues presented by the case. It decided that more facts were necessary and that only when all facts and issues had been distinguished could the case ultimately be resloved. Consequently, the issues were remanded to the trial court of complete adjudication there. (Spiegel-Florida)
W79-01189

HOLLISTER PARK INVESTMENT CO. V. GOLETA COUNTY WATER DISTRICT (NO DAMAGES TO LANDOWNER DENIED WATER DURING WATER SHORTAGE EMERGENCY).
147 Cal. Rptr. 91-93 (Ct. App. 1978).

Descriptors: *Water supply, *Water districts, *California, *Water rights, Legislation, Water allocation(Policy), Distribution, Water shortage, Water users, Competing uses, Damages, Land tenure.

Plaintiff landowner owned nearly 25 acres of property inside the Goleta County (California) Water District. Plaintff's land had not been developed when the district adopted a resolution declaring an emergency water shortage of 4,000 acre-feet per year. Because of this shortage, no new water service connections were approved pending evaluation and planning for supplemental water sources. Plaintiff, unable to secure a connection to the district's water service, was consequently unable to develop his land. Plaintff could not maintain financing for the property and it was eventually sold in forclosure sale. Plaintiff then filed a suit seeking damages in inverse condemnation, arguing that he had a constitutional right to a 'reasonable level' of utility service and that the ordinance in question represented a 'no growth' policy. The trial court held that as a potential user, plaintiff did not have an absolute right to the water, as did existing users. The court also decided that because a moratoruim on new services existed only during emergency situations and because the district was attempting to develop an expansion plan for water use, damage to the landowner was not compensable. (Spiege-Florida)
W79-01190

PHILADELPHIA CHEWING GUM CO. V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (LAND-OWNERS AND OCCUPIERS LIABLE FOR CORRECTION OF POLLUTING CONDITION).
387 A. 2d 142-53 (Pa. Commw. Ct. 1978).

Descriptors: *Pennsylvania, *Water quality control, *Land tenure, *Pollution abatement, Land use, Administrative agincy, Legislation, Water pollution sources, Groundwater, Costs, Remedies.

Petitioners, landowners and land occupiers, requested a review of a Pennsylvania Environmetal Hearing Board order. In deciding whether the state can direct a landowner or occupier to correct a water polluting condition on the land--a condition which was created by neither the landowner nor the occupier-the curt held that the Department could order the correction of such a polluting condition. However, such owner or occupier would be liable for the cost of correction only if he permitted or authorized the creation of the condition, or if he knows or should know of the existence of the condition and associates himself in some affirmative conduct indicating adoption of the polluting condition. Here, even though the polluting condition on the land may have been created before the enactment of a stature imposing liability on landowners and occupiers for correction of the condition, the statute was not 'ex post facto' legislation because it was the present land condition which was to be corrected. Also, because the parties here were not 'blameless', the state was not required to prove or show the feasability of the abatement corrections mandated. (Spiegel-Florida)
W79-01191

WARRIOR, INC. V. EASTERLY (DEVELOPER ASSESSED DAMAGES CAUSED BY EXCESS DRAINAGE WATER AND DEBRIS POLLUTING LANDOWNER'S POND,
360 So.2d 700-04 (Miss. 1978).

Descriptors: *Mississippi, *Drainage effects, *Damages, *Riparian rights, Ditches, Reasonable use, Discharge(Water), Surface waters, Channels, Water rights, Construction, Drainage water.

Plaintiff corporation sued adjacent landowners in a water drainage action. Plaintiff was building a subdivision of homes on property next to defendat's land. During this construction period, water flowed from a drainage ditch on plaintiff's land into a pond on defendant's property. The corporation accelerated the water flow into the pond by removing obstructions from the ditch. Defendant's pond filled with sand and trash. Defendant and plaintiff agreed the pond would be cleaned after completion of the subdivision. However, defendant then excavated the pond on his own. Plaintiff corporation sued, alleging defendant's action had allowed the drainage water flow, causing it to back up onto the subdivision. Defendant landowners cross complained, seeking damages because of the water from the subdivision. The trial court enjoined the corporation from continuing its drainage activity. On appeal, the Mississippi Supreme Court held that while an upper riparian owner may reasonably drain surface waters into a water course, he cannot collect surface waters and discharge them in a concentrated flow upon adjoining owners. Although the injuction was dismissed, monetary damages were awarded to defendats in lieu of the injuction. (Spiegel-Florida)
W79-01192

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
J. A. Carver, Jr.
Public Utilities Fortnightly, Vol. 95, No. 9, p 29-33. April 24, 1975. OWRT C-5205(No. 4210)(2), 14-31-0001-4210.

Descriptors: *Thermal powerplants, *Heatingm, *Energy, *Thermal energy, *Heat transmission, *Legal aspects, *Institutional constraints, Water policy, Administration, Administrative agencies, Economics, Planning, Political aspects, Organizations, Regulation, Utilities, Heated water, Electric power, Electric power industry.

Load patterns of electricity and heat do not match on a daily or seasonal basis. Storing large amounts of useful heat in underground aquifers is being studied and appears feasible. If overall system efficiency of a nuclear energy plant can be doubled by generating and delivering useful heat as well as electricity, the new resource for each thousand-megawatt plant would be at least 5 million barrels of oil per year. Electric-utility planning has been motivated more by a desire to reduce costs than to conserve resources. The deferred costs of oil and gas must now be paid. Research is needed to find a way to account for costs and benefits of energy conservation and pollution control in resource terms rather than in dollars, as a basis for decision. Visualizng a Federal a Federal law or regulatory policy to successfully mandate thermal efficiency is difficult, but an equivalent condition is national law on water and air quality standards. Many elements of a national strategy for macro-conservation of energy are already in place: government-financed R and D, demonstration projects, leasing and tax policies. But barriers strew the path toward implementing an innovative, energy-conserving system of marketing heat. Electric utilities, gas utilities, water utilities, or a combination of these, may be the logical service companies. Formation of a company with strictly a transmission function can be visualized. Whether, how, and to what extent transmission and distribution of heat should be regulated requires consideration by public agencies supported by economic research. The most nettlesome problem is water and water-rights administration. Public education is of crucial importance. (Meyer-General Electric TEMPO)
W79-01227

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W79-01229

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. at Urbana-Champaign. Dept of Ecology, Ethology, and Evolution.
J. R. Karr, and I. J. Schlosser.
Science, Vol. 201, No. 4352, July 1978, p 229-234. 4 fig, 2 tab, 56 ref.

Descriptors: *Water law, *Water resources development, *Sediment-water interfaces, Legal aspects, Legislation, Water quality, Administration, Planning, Management, Water management(Applied), Erosion control.

Development and implementation of local and regional plans to control non-point source of pollution from agricultural land are major mandates of

section 208 of Public Law 92-500 (Federal Water Pollution Control Act Amendments of 1972). Many planners tend to equate erosion control as measured by the universal soil loss equation with improvements in water quality. Others implement channel management practices which degrade rather than improve water quality and thereby decrease the effectiveness of other efforts to control nonpoint sources. Planners rarely recognize the importance of the land-water interface in regulating water quality in agricultural watersheds. More effective planning can result from the development of management systems which incorporate theory from all relevant disciplines. (Steiner-Mass)
W79-01295

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
M. W. Lefor, and W. C. Kennard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 917, Price codes: A04 in paper copy, A01 in microfiche. Institute of Water Resources Report No 28, 1977. 69 p, 4 fig, 39 ref, 3 append. OWRT B-010-CONN(3). 14-31-0001-5062.

Descriptors: *Wetlands, *Legislation, *Legal aspects, *Land use, Geology, Hydrogeology, Hydrology, *Biology, *Economics, Political aspects, Public health, *Classification, Connecticut, *Inland wetland definitions, Resource management, *Systems ecology, *Land use regulation, *Legal definition, Connecticut Inland Wetlands and Watercourses Act, Sociology.

The results of a year-long study of various definitions of inland wetlands for the purpose of developing multifaceted technical, operational and legal definitions are presented. A multi-disciplinary group took part in project seminars and contributed working definitions from the following fields of study: geology, hydrogeology, hydrology, biology, systems ecology, economics, sociology, soil science, political science, public health and law. Contributions from the first six disciplines mentioned are discussed in detail in this report and were used in writing a final theoretical (ideal) definition of inland wetlands for the glaciated northeastern United States. A proposed legal definition for Connecticut is also offered with descriptors and explanations of terms. Such definitions are designed to help formulate criteria for policy analysis of wetlands and other water resources, and to unify and improve existing legislation on wetlands.
W79-01335

THE NATIONAL ENERGY PLAN,
Federal Energy Administration, Lakewood, CO. Region VIII.
For primary bibliographic entry see Field 6B.
W79-01480

LEGITIMACY OF WESTERN IDENTITY IN AN ECONOMIC BALANCE WATER - LAND - ENERGY - PEOPLE,
Federation of Rocky Mountain States, Denver, CO. Western States Energy Policy Office.
For primary bibliographic entry see Field 6B.
W79-01481

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01491

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
For primary bibliographic entry see Field 6A.
W79-01494

6F. Nonstructural Alternatives

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-01122

PROPOSED (GUIDELINE MODEL) COASTAL AND RIVERINE FLOOD PLAIN ZONING ORDINANCE,
Virginia State Water Control Board, Richmond.
D. A. Kubicek.
April, 1976. 23 p.

Descriptors: *Local governments, *Virginia, *Insurance, *Flood plain zoning, Flood plains, Floodways, Non-structural alternatives, Regulation, Flood proofing, Land classification, Mapping, Land use.

Drafted as a guideline model for Virginia communities, this is a proposed, preliminary ordinance regulating local flood plain development. Its authors designed the model ordinance to comply with the requirements of the National Flood Insurance Program administered by the federal Department of Housing and Urban Development. The model ordinance would create local flood hazard districts and require that a permit be obtained by owners of property within a district for all proposed construction. The model ordinance provides for an interim definition of 100-year flood elevations, of floodways, and of floodplains. Also included is a list of land uses permitted in regular zoning districts and the general restrictions of the Floodplain Management Regulations which must be complied with to gain approval for a specific use. The model ordinance also provides for special structures which may be permitted under a zoning variance, but stipulates that a variance will be granted only as the result of an undue hardship. Finally, the model ordinance includes special regulations regarding floodproofing, mobile homes and mobil home subdivisions, and provides penalties for violation of the regulations. (Stump-Florida)
W79-01147

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
J. M. Hawkes, and D. King.
Ecology Law Quarterly, Vol 6, No 4, p 755-83, 1978.

Descriptors: *Permits, *Regulation, *Land use, *Legal aspects, Legislation, State governments, Zoning, Coasts, Construction, Judicial decisions, California.

An increase of government regulation at all levels of land use planning has resulted in the assertion by many developers that their projects should be exempt from regulations promulgated after work has begun under the doctrine of vested rights. Developers have sought to broaden the traditionally narrow application of the doctrine and to exempt projects in relatively low stages of construction. California's codification of the vested rights doctrine requires: (1) substantial expenditures; (2) good faith reliance; and (3) a valid building permit in order for the developers to claim a vested right in completing their projects pursuant to the old regulations. In AVCO Community Developers, Inc. v. South Coast Regional Commission, the California Supreme Court faced the issue of whether the building permit standard should be replaced by another standard, or possibly replaced by a case-by-case determination of whether a vested right had been obtained in each particular set of facts. Although the court did not rule that a building permit would be required in every case, it did conform the narrowest construction of the vested rights doctrine consistent with procedural due process. (Stump-Florida)
W79-01148

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6B.
W79-01153

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01336

FRAGILE LANDS AND PEOPLE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-01487

6G. Ecologic Impact Of Water Development

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 5G.
W79-01152

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield.
For primary bibliographic entry see Field 6E.
W79-01168

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, P. J. Godfrey, and W. E. Odum.
American Scientist, Vol. 61, No. 2, p 152-162, March-April, 1973. 13 fig, 19 ref.

Descriptors: *Barrier Islands, *Beach erosion, *Salt marshes, *North Carolina, Aquatic plants, Dunes, Beaches.

Salt marsh formation on the sound side of the Outer Bank, North Carolina, is due in part to oceanic overwash. High tides and high waves occasionally succeed in eroding low-lying foredunes and carrying sand and shell completely across the island into the marshes. Stabilization of barrier islands by man has caused changes in beach, dune, and marsh morphology and in plant community composition. Artificial stability has changed a dynamic stable ecosystem capable of withstanding continual stress to one that would be destroyed if a major storm were to breach man-made barrier dunes. Survival of the remaining natural beach environments along the coast of North Carolina in areas recently purchased by the National Park Service requires a strategy of submission and rebuilding. (Howard-Mass)
W79-01220

AN ECOLOGICAL STUDY OF A BALDCYPRESS SWAMP IN ST. CHARLES PARISH, LOUISIANA,
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 2L.
W79-01226

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
In: Electric Power and the Civil Engineer Confer-

ence Papers, Power Division, Specialty Conference, Boulder, Colorado, Aug. 12-14, 1974, p 653-665, American Society of Civil Engineers, New York, N.Y., 1974. OWRT C-5222(No. 4213)(1), 14-31-0001-4213.

Descriptors: *National Environmental Policy Act, Information, Policy-making, Long-range planning, Environmental alternatives.

The National Environmental Policy Act of 1969 alters existing information flows in environmental policy-making by 'action-forcing' provisions requiring research, consideration of environmental consequences, and environmental impact statements. Experience for three years indicates that changes in information use occur slowly and unevenly. Policy-makers accept environmental information when its utility is greater than its cost. Utility, a summation, expresses the costs of obtaining and consuming information, and value conflict. Information demands lead institutions to seek knowledge, alternatives, and resources. The courts and environmental interest groups are forcing a more positive agency approach to NEPA. Long-range planning for fossil-fueled power generation will require understanding the provisions of NEPA, and analyzing projects as environmental alternatives.
W79-01229

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
A. Herson.
Journal of Environmenta Systems, Vol 7, No 1, 1977-78, p 35-44. (California Water Resources Center Project UCAL-WRC-W-503).

Descriptors: *Decision making, *Computer models, *Planning, Environmental effects, Model studies, Alternative planning, Systems analysis.

The weighting and aggregation of project impacts in weighted decision models commonly employed for environmental decisionmaking are reviewed. An alternative method, the systematic analysis of project impacts, is proposed for certain decision problems. Advantages of weighted decision models include the explicit quantification of decisionmaker values and the usefulness of systems analysis techniques for optimizing decisions. Disadvantages include the assumption of unanymity of values among affected publics and unresponsiveness to the needs of many participants in the decisionmaking process. For controversial decision problems with substantial implications for different social groups, explicit analysis of trade offs among impact areas or project goals is advanced as a method superior to the quantitative weighting and aggregation of impacts. (Snyder-Calif Davis)
W79-01242

THE EFFECT OF FIRE ON SPECIES COMPOSITION IN CYPRESS DOME ECOSYSTEMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 4C.
W79-01292

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye.
For primary bibliographic entry see Field 2H.
W79-01297

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6B.
W79-01353

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
E. E. Possardt, and W. E. Dodge.
Wildlife Society Bulletin, Vol. 6, No. 1, p 18-24, 1978. 2 tab, 3 fig, 13 ref.

Descriptors: *Vermont, *Channel improvement, *Streams, *Non-game birds, *Small animals(Mammals), *Habitats, Environmental effects, Biological communities, Sampling, Stream improvement, Birds, Song birds, Mammals, On-site investigations, *Channelization, *Streamside habitats, *Species diversity, *White River Watershed(Vermont), Sandpipers, Thrushes, Vireos, Mice, Shrews.

The effects of stream channelization on songbirds and small mammals were documented in the White River watershed, Vermont 1 yr (1974) ad 2 yr (1975) after channelization had occurred. Birds were mist-netted during four sampling periods. The percentages of birds collected from channelized areas were 33 percent for fall 1974, 27 percent for spring 1975, and 38 percent and 46 percent for early and late summer 1975 sampling periods. Species diversity was significantly less in channelized areas for fall 1974 and early summer 1975. The greater diversity in non-channelized areas during spring 1975 was highly significant. No significant difference existed for late summer 1975. Swallows and spotted Sandpipers were more abundant in channelized areas while thrushes, vireos, and particularly warblers were more abundant in non-channelized areas. Small mammals were live trapped during three sampling periods. Of all small mammals collected 28 percent were from channelized areas in fall 1974, ad 39 percent each in early summer, and in late summer 1975. Shrews (Blarina brevicauda, Sorex cinereus) and jumping mice (Zapus hudsonicus, Napeozapus insignis) were the most adversely affected small mammals while the white-footed mouse (Peromyscus leucopus), the most abundant small mammal collected, recovered rapidly in the channelized areas. The most drastic impact on small mammal and songbird populations occurred at the channelized sites where streamside vegetation had been extensively destroyed. (EILS-Katz)
W79-01431

GREAT BLUE HERONS RESPOND TO NESTING HABITAT LOSS,
Fish and Wildlife Service, Corvallis, OR. Patuxent Wildlife Research Center.
C. J. Henny, and J. E. Kurtz.
Wildlife Society Bulletin, Vol 6, No. 1, p 35-37, 1978. 1 tab, 2 fig, 8 ref.

Descriptors: *Environmental effects, *Nesting, *Animal behavior, *Wildlife habitats, *Shore birds, Nests, Nesting cover, Behavior, Habitats, Shoreline cover, Waterbirds, Dams, River flow, Columbia River, *Great Blue Heron, Ardea.

Great blue herons (Ardea herodias) were found to be nesting on channel markers along the Columbia River near Umatilla, Oregon. After the construction of the John Day Dam changed the flow and boundaries of te Columbia River, the nesting trees of the herons were destroyed. As a result of this loss of nesting habitat, channel markers provided an adequate substitution due to their isolation from human activity and proximity to a food supply. Land managers may be able to establish artificial nesting sites where great blue heron nesting habitat has been destroyed. (EIS-Katz)
W79-01432

WATERFOWL COLLISIONS WITH POWER LINES AT A COAL-FIRED POWER PLANT,
Illinois Natural History Survey, Urbana.
W. L. Anderson.
Wildlife Society Bulletin, Vol. 6, No. 2, p 77-83, 1978. 2 fig, 3 tab, 7 ref.

Descriptors: *Waterfowl, *Environmental effects, *Mortality, *Power system operation, Animal behavior, Birds, Mallard duck, Blue-winged teal, Powerplants, Aquatic populations, Electrical equipment, On-site data collections, *American coots, Anas, *Power lines, *Lak Sangchris(Illinois).

Between 200 and 400 waterfowl (0.2-0.4 percent o maximum number present) were killed each fal 1973-1975, by colliding with high-voltage transmis sion lines that cross the slag pit ast the Kincai power Plant and adjacent Lake Sangchris, centr Illinois. Mallards (Anas platyrhynchos) constitute 37% of the victims, blue-winged teals (A. discord 17%, and American coots (Fulica americana) 2 percent. Blue-winged teals were most vulnerabl to collisions andmallards least vulnerable. Facto contributing to frequency of collisions were (number of waterfowl present, (2) weather cond tions and visibility, (3) species composition or b havior of birds, (4) disturbance, ad(5) familiarity birds with the area. Power lines should not be bui over water unless alternate routes do not exis lines should not cross areas where waterfowl co centrate; and visibility of lines in problem are should be enhanced. (EIS-Katz)
W79-01434

APPLYING A CHEMICAL MODELLIN TECHNIQUE TO ECOLOGICAL PROBLEM
Department of Scientific and Industrial Researc Lower Hutt (New Zealand). Physics and Eng neering Lab.
For primary bibliographic entry see Field 5B.
W79-01444

CONFERENCE PROCEEDINGS - A CRITICA ECONOMIC BALANCE, WATER - LAND ENERGY - PEOPLE - HELD AT COLORAD STATE UNIVERSITY, PINGREE PAR CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
For primary bibliographic entry see Field 6B.
W79-01478

7. RESOURCES DATA

7A. Network Design

TIME AVERAGED AREAL MEAN OF PR CIPITATION: ESTIMATION AND NETWOR DESIGN,
Puerto Rico Univ., Mayaguez.
For primary bibliographic entry see Field 2B.
W79-01357

PROGRAM FOR MONITORING SURFAC WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water R sources Div.
For primary bibliographic entry see Field 7C.
W79-01376

7B. Data Acquisition

THE RELATIONSHIP BETWEEN RADAR R FLECTIVITY FACTOR AND HAIL AT TH GROUND FOR NORTHEAST COLORAD THUNDERSTORMS,
National Center for Atmospheric Research, Bou der, CO.
J. E. Dye, and B. E. Martner.
Journal of Applied Meteorology, Vol. 17, No. 9, 1335-1341, September 1978. 5 fig, 3 tab, 17 r

Descriptors: *Hail, *Radar, *Remote sensin *Colorado, Storms, Thunderstorm Precipitation(Atmospheric), Rainfall, Measur ment, Reflectance, Weather patterns, Weathe Meteorology, Radar reflectivity.

Data from the hailpad network of the Nation Hail Research Experiment were examined in re tion to the equivalent radar reflectivity facto recorded in the lowest level sweeps of the rad beam over the pads during hailstorms in 1972 a 1976. The relationship between hail detected at t ground and reflectivity factor was examined f both areal coverage and on a point-by-point ba

for each hailpad. The comparisons showed that reflectivity factors of 55 dBZ often are measured when no hail is observed at the ground. Rain alone can give rise to reflectivities of this magnitude. The results of the study showed that in northeastern Colorado low-level equivalent radar reflectivity factors alone cannot be used to determine the region of hailfall at the ground, nor are they likely to augment quantitative measurements by a ground network of hail sensors. The results found in northeastern Colorado were compared to results from other geographical regions. (Sims-ISWS)
W79-01037

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5A.
W79-01042

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
A. D. Lovell, J. W. Ellis, R. R. Brice, and A. W. Thomas.
Agricultural Engineering, Vol. 59, No. 10, p 44-45, October, 1978. 4 fig.

Descriptors: *Water level fluctuations, *Logging(Recording), *Wells, *Remote sensing, *Soil water, Piezometers, Electronic equipment, Potentiometers, Pressure measuring instruments.

An inexpensive device which accurately records pressure head changes from near the soil surface to below the 10-ft. depth during a rainfall is described. It is capable of remote recording of water level changes in 1.3 cm (1/2 in.) ID piezometer tubes to within 5 mm (3/16 in.). The water level sensing component consists of a sensor and electric circuitry to control a 26-V d-c permanent-magnet reversible 25-rpm electric motor that moves the sensor vertically. The sensor is suspended over a pully on the end of a 10-turn 50-K potentiometer. It is connected to a data logger which measures resistance and, through calibration, expresses the water level in the well. (Purdin-NWAA)
W79-01101

WATER CHEMISTRY AND THE RELIABILITY OF ELECTRONIC FIELD INSTRUMENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 5A.
W79-01333

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-01374

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES,
Geological Survey, Lubbock, TX. Water Resources Div.
For primary bibliographic entry see Field 8C.
W79-01378

MICROWAVE REMOTE SENSING OF SEA ICE IN THE AIDJEX MAIN EXPERIMENT,
Geological Survey, Tacoma, WA. Water Resources Div.; and Department of the Environment, Ottawa(Ontario).
For primary bibliographic entry see Field 2C.
W79-01386

TIDAL SAMPLER,
Depart of Energy, Wash., DC. (Assignee).
D. W. Hayes.
U.S. Patent No. 4,095,471, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 927, June 20, 1978.

Descriptors: *Patents, *Sampling, *Water sampling, Tidal waters, Tidal energy.

An aparatus for pumping a sample of water or other liquid uses the energy generated from the rise and fall of the liquid level to force a sample of the liquid into a collection vessel. A suction vessel and booster vessel with interconnecting tubing and check valves are responsive to an oscillating liquid level to pump a portion of the liquid into a collection vessel. For optimum efficiency, the suction vessel must be completely submerged at the point of highest liquid level or high tide. The device is used for automatic and continuous sampling of water in remote locations and can be unattended for extended periods. (Sinha - OEIS)
W79-01388

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.
W79-01422

7C. Evaluation, Processing and Publication

BED FORMS AND STRATIFICATION TYPES OF MODERN GRAVEL MEANDER LOBES, NUECES RIVER, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 2J.
W79-01044

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01047

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
For primary bibliographic entry see Field 8G.
W79-01057

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01089

WELL LOGS...ARE THEY REALLY NECESSARY,
California State Dept. of Water Resources, Sacramento.
R. S. Ford.
Pacific Groundwater Digest, Vol. 1, No. 1, p 13-15, September, 1978.

Descriptors: *Well data, *Water wells, *Drillers logs, *Groundwater resources, Aquifer systems, Cross-sections, Aquifer characteristics, Monitoring, Water quality, Computer programs, Subsurface mapping, Water law.

Well logs or water well drillers' reports are a valuable tool in ground water resource planning. Well logs are used in the following ways: (1) To plot maps of aquifer systems at various depths or to locate buried channels and determine the direction of ground water flow; (2) To prepare geologic cross-sections of a basin to supplement the maps and provide a three-dimensional concept of the ground water basin; (3) To determine the water-yielding capability and storage capacity of aquifer systems by using the average specific yield of all material reported in the log; (4) To monitor ground water quality by sampling from only those wells which obtain water from a particular aquifer. Well logs are useful only if the exact locations of the wells are known. Many well logs are of no value because the driller gave only a rough idea of the well's location. Drillers benefit from filing accurate well logs in that they help formulate ground water management plans which require new wells or deepening of existing wells. Also, they have access to a vast store of hydrogeologic information to supplement their own knowledge gained through years of drilling experience. (Purdin-NWWA)
W79-01119

CHARACTERISTICS OF RAINFALL CONDITIONS WITH PARTICULAR REFERENCE TO NORTH EAST ENGLAND,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 2B.
W79-01247

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
For primary bibliographic entry see Field 2L.
W79-01256

GENERATION OF DAILY PRECIPITATION OVER AN AREA,
Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 2B.
W79-01261

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W79-01269

SENSITIVITY ANALYSIS OF A PHOSPHORUS REMOVAL STRATEGY COMPUTER MODEL,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5D.
W79-01310

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4D.
W79-01355

TIME AVERAGED AREAL MEAN OF PRECIPITATION: ESTIMATION AND NETWORK DESIGN,
Puerto Rico Univ., Mayaguez.
For primary bibliographic entry see Field 2B.
W79-01357

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.

R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Aquifers, *Maps, *Water yield, *Groundwater resources, Groundwater potential, Groundwater availability, *Niagara aquifer(Wis).

A map, at a scale of 1:100,000 shows the probable yields of wells in the Niagara aquifer, Wisconsin. The Niagara aquifer consists of all saturated rocks of Silurian and Devonian age in Wisconsin. It underlies less than 10 percent of the State but supplies water to numerous domestic wells in eastern Wisconsin. The aquifer is a fine- to medium-grained dolomite with a maximum thickness of about 600 feet. Water occurs in vertical and bedding-plane joints, many of which have been enlarged by solution. Well yields depend on the number and size of water-bearing fractures open to the well. Well yields, in gallons per minute, are areally delineated by three probability ranges--areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 500 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)
W79-01367

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
G. H. Hughes.
Florida Bureau of Geology Map Series No 81, 1978. 1 sheet, 3 fig, 13 ref.

Descriptors: *Runoff, *Geographical regions, *Florida, *Streamflow, *Average runoff, Rainfall-runoff relationships, Surface runoff, River basins, Topography, Geology, Evapotranspiration, Infiltration, Maps.

A map shows the average annual runoff from hydrologic units in Florida. Runoff is that part of precipiation that appears in surface streams, including the water that infiltrates to ground-water bodies and subsequently emerges in streams as well as that which flows overland directly into stream channels. In Florida as a whole the annual runoff averages about 14 inches, but it varies considerably with respect to both time and space. The average annual ruonff ranges from 5 inches or less in some parts of Florida to 30 inches or more in other parts. As a result of variations in rainfall between extreme wet and dry years, the annual runoff from a given area can vary several inches. Spatial variations in runoff result from regional differences in rainfall, differences in the evaporation potential of the atmosphere, and differences in the topographic and geologic characteristics of the land surface. In general, given the same rainfall, those physiographic factors that work to hold water on the land surface promote evapotranspiration and reduce runoff, and those that expedite the flow of water from an area reduce evapotranspiration and increase runoff from that area. (Woodard-USGS)
W79-01368

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Dissolved solids, *Groundwater, *Maps, *Water quality, Aquifers, Water wells, *Niagara aquifer(Wis).

A map, at a scale of 1:100,000, shows the dissolved-solids concentration of water in the Niagara aquifer, Wisconsin. Natural water quality, as indicated by the total dissolved-mineral matter in the water, is shown for the saturated aquifer on a contour map in 100 milligram per liter intervals. Areas with values greater than 500 milligrams per liter are not contoured, but dissolved-solids concentration is shown for individual wells yielding water containing more than 1,000 milligrams per liter total solids. These values are not considered areally representative and are not used in contouring. (Woodard-USGS)
W79-01369

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Water-Data Report FL-77-2A, July 1978. 662 p, 14 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites, *Southern Florida.

Water resources data for the 1977 water year for southern Florida include discharge records for 71 streams, stage-only records for 129 streams, elevations for 21 lakes, miscellaneous measurements, crest-stage partial records for 3 streams, and water quality data for approximately 229 surface water sites. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01370

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Geological Survey Water-Data Report FL-77-2B, July 1978. 620 p, 18 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites, *Southern Florida.

Water resources data for the 1977 water year for southern Florida include water level measurement for 213 wells and water quality data for approximately 229 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
Water-Data Report NH-VT-77-1, August 1978. 196 p, 3 fig, 1 tab.

Descriptors: *New Hampshire, *Vermont, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for New Hampshire and Vermont consist of records of stage, , discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 92 gaging stations, stage records for 4 lakes, month end contents for 25 lakes and reservoirs, water quality for 9 gagin stations, and water levels for 19 observation wells. Also includeed are data for 39 crest-stage and 2 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. A few pertinent stations in bordering States and Province of Quebec are also included. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Hampshire and Vermont. (Woodard-USGS)
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Water-Data Report FL-77-1, July 1978. 672 p, 33 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northeast Florida.

Water resources data for the 1977 water year in northeast Florida include discharge records for 46 streams, stage only records for 24 streams, elevations for 67 lakes, water level measurements for 79 wells, crest-stage partial records for 20 streams, and water quality data for 106 streams and 92 wells. These data represent the National Water Data System record collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01373

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
G. G. Phelps.
Florida Bureau of Geology, Tallahassee, Map Series No 82, 1978. 1 sheet, 2 fig, 1 tab, 6 ref.

Descriptors: *Water quality, *Chemical analysis, *Water supply, *Municipal water, *Florida, Maps, Dissolved solids, Water quality standards, Water treatment, Untreated water quality, Environmental Protection Agency.

The U. S. Geological Survey collected quality-of-water information from more than 120 Florida cities and towns in 1975. Untreated samples (samples of water taken directly from wells or streams) were analyzed for comparison with the Environmental Protection Agency's Water Quality Criteria for untreated water. Water treatment by most municipalities consists of filtration, aeration, and disinfection with chlorine. When several municipalities in the same county were sampled, the sample with the highest dissolved-solids concentration (and thus generally the poorest overall quality) was indicated on a map. Therefore, one can expect untreated source water used for municipal supply in each county to be of the quality shown on the map or better. Nearly all the municipal water supplies in Florida meet the Environmental Protection Agency's Water Quality Criteria, which are outlined in the text. Those counties where exceptiions occur are shown in inset figures. Failure to meet all the recommendations does not imply that the water is unsafe. Rather, the criteria are recommendations to be used as a goal to establish and maintain good water quality. dissolved-solids concentrations of the source waters sampled ranged from less than 100 mg/liter to more than 500 mg/liter. A reference is given for detailed information about the source of municipal water supplies, including analyses of samples. (Woodard-USGS)
W79-01375

PROGRAM FOR MONITORING SURFACE-WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. J. Slack
Florida Bureau of Geology, Tallahassee, Map Series No 76, 1977. 1 sheet, 2 fig, 6 tab, 2 ref

Descriptors: *Water quality, *Surface waters, *Florida, *Maps, Data collections, Sites, Network design, Monitoring, Sampling, Frequency, Cost sharing, Publications, Data storage and retrieval.

The purpose of this water atlas is to inform the reader of the overall operation and extent of the program for monitoring surface-water quality in Florida: the history and funding of the program, the purpose and objectives of the network of monitoring stations by hydrologic categories, the frequencies of sampling, the types of water-quality data collected, and how these data are published and used. The distribution of stations in the monitoring program as of April 1976 is shown on a large map. The distribution and number of stations in a given area is determined by the extent to which information is needed. This generally is the result of water-quality problems related to increasing usage by municipalities, industries, and ag
W79-01376

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
Open-file report 78-436, May 1978. 39 p, 3 fig, 2 tab.

Descriptors: *Montana, *Hydrologic data, *Networks, *Surface waters, *Water quality, Sedimentation, Groundwater, Sampling, Sites, Data collections, Annual.

Hydrologic-data stations are maintained at selected sites throughout Montana to collect basic information concerning streamflow ground-water levels, quality of water, sediment concentrations in streams, and depth and water content of snowpack. The network of stations is revised periodically to ensure collection of meaningful and worthwhile data. This report covers investigations made from October 1977 through September 1978. The locations of data-collection stations are shown on maps for surface water and water quality. Surface-water and water-quality stations in operation as of October 1977 also are listed in tables. (Woodard-USGS)
W79-01379

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. E. Dysart, and D. A. Goolsby.
Florida Bureau of Geology, Tallahassee, Map Series No 77, 1977. 1 sheet, 2 fig, 2 tab, 10 ref.

Descriptors: *Dissolved solids, *Florida, *Surface waters, *Water quality, Streams, Rivers, Canals, Springs, Maps, *Dissolved-solids concentrations, *Dissolved-solids discharge, *Dissolved-solids load.

Maps and tables of dissolved-solids data in Florida surface waters show considerable statewide variation. Concentrations of dissolved solids are highest in the canal system of south Florida, the St. Johns River basin, and most major springs. Other Florida surface waters have concentrations of less than 200 mg/liter. The St. Johns, Apalachicola, and Suwannee Rivers carry 66 percent of the 13 million tons of dissolved-solids load discharged annually to the Gulf of Mexico and Atlantic Ocean. Seventeen percent of the annual load is carried by canals and 17 percent by the smaller rivers. (Woodard-USGS)
W79-01382

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. T. Rutledge, and H. F. Grubb.
Open-file report 78-460, 1978. 7 sheets.

Descriptors: *Hydrogeology, *Groundwater recharge, *Aquifer characteristics, *Maps, Data collections, Core drilling, Hydraulic conductivity, *Florida, *Green Swamp area(Fla), *Florida aquifer, *Withlacoochee River(Fla), *Little Withlacoochee River(Fla), Clay beds, Leakance.

Information about the hydrogeology of that part of the Green Swamp area which has been designated by Southwest Florida Water Management District as the Flood Detention Area is given on seven maps. The maps show (1) core-hole numbers, (2) sand thickness, (3) clay thickness, (4) clay vertical hydraulic conductivity, (5) clay leakance, (6) depth to Floridan aquifer, and (7) altitude of top of Floridan aquifer. The data were obtained from 85 core holes drilled in 1977 and from 24 core hole drilled previously. The 127 square-mile study area is part of the headwaters of the Withlacooche River and the Little Wthlacoochee River. The data will be useful in future water-resources planning and in a concurrent interpretive study of the Green Swamp area. (Woodard-USGS)
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W79-01426

APPLYING A CHEMICAL MODELLING TECHNIQUE TO ECOLOGICAL PROBLEMS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
For primary bibliographic entry see Field 5B.
W79-01444

8. ENGINEERING WORKS

8A. Structures

FIRST INSPECTIONS HIGHLIGHT US DAMS THREAT.
For primary bibliographic entry see Field 8G.
W79-01048

BREAKWATER,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). (Assignee).
D. H. Desty, and R. Duckworth.
U.S. Patent No. 4,098,086, 9 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 59, July 4, 1978.

Descriptors: *Patents, *Breakwaters, *Engineering structures, Coastal structures, Shore protection, Waves(Water), Ocean waves, Floating, Offshore platforms, Attenuation.

A floating breakwater suitable for reducing the height of waves comprises: a plate of material substantially rigid in its beam direction; means for positioning the plate at right angles to the direction of the waves thus making the beam direction parallel to the wave direction; the plate having a wavelength to beam ratio of 0.5 to 5; means for locating the upper surface of the plate at a depth of 1/5 to 1/40 the plate beam length below the mean surface level; and means for allowing rocking of the plate along a horizontal axis substantially at right angles to the plate beam direction. In order to facilitate this rocking mode, particularly when reducing wavelengths greater than the plate beam length, the plate preferably has considerable mass located near the central axis parallal to the water surface and at right angles to the wave direction giving a low moment of inertia about this axis. The object of the invention is to provide a floating wave reduction system which substantially attenuates wave height during its passage towards the installation being protected. (Sinha-OEIS)
W79-01400

8B. Hydraulics

FISH LADDER FOR CHARLES RIVER DAM, CHARLES RIVER, MASSACHUSETTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8I.
W79-01052

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
R. A. Deju, and W. K. Summers.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-C-00007, Price codes: A03 in paper copy, A01 in microfiche. Report ARH-C-00007(CA-168-RAD-5), April 1, 1975. 236 p, 9 fig, 7 tab, 27 ref. ERDA AT(45-1)-2130.

Descriptors: *Groundwater, *Hydraulic conductivity, *Transmissivity, *Washington, *Columbia River, Rocks, Sedimentary rocks, Groundwater movement, Drillers logs, Lithologic logs, Geology, Porosity, Storage coefficient, On-site investigations, Laboratory tests, *Hanford Reservation(Wash).

The Hanford Reservation, Washington, occupies 365,000 acres (570 sq mi) of land within the Columbia Basin geologic province. This location was selected in early 1943 by the Army Corps of Engineers as the site for reactor and chemical separation facilities for the production and purification of plutonium needed in the development of nuclear weapons. To understand adequately the groundwater flow regime of the Hanford Reservation, data were gathered and tests were conducted by various investigators to define appropriately the hydraulic characteristics of the underlying sediment. This report examined the overall hydraulic characteristics of the sediment overlying the topmost basalt flow beneath Hanford. All data available were examined and used in the preparation of the report. The sedimentary rocks of the Pasco Basin include glaciofluviatile deposits and the Ringold Formation. They also may include sedimentary rocks interbedded with the basalts. In terms of the groundwater flow continuum, these rocks are divided into the unsaturated zone, the upper dominantly coarse-clastic part of the zone of saturation, and the lower dominantly fine-grained part of the zone of saturation. Drillers' logs combined with pumping tests were used to estimate and map the transmissivity and mean hydraulic conductivity of the saturated sedimentary rocks. The logs showed that the largest values of transmissivity and mean hydraulic conductivity in the unconfined aquifer occur where the saturated thickness of the Pasco Gravels is largest. Intermediate values occur where the Pasco Gravels are thinnest and the Middle Ringold Conglomerates are thickest. Low values occur where the Middle Ringold Conglomerate is thin, the Pasco Gravels are non-existent, and the Lower Ringold makes up the bulk of the saturated section. (Sims-ISWS)
W79-01053

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-01060

EVALUATION OF DESIGN METHODS OF SUBSURFACE DRAINAGE FACILITIES FOR HIGHWAYS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W79-01061

FIELD STUDY OF SEDIMENT TRANSPORT CHARACTERISTICS OF THE MISSISSIPPI RIVER NEAR FOX ISLAND (RM 355-6) AND BUZZARD ISLAND (RM 349-50),
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W79-01065

A WATER WELL EVALUATION SYSTEM,
B. G. Sweet.
Mining Engineering, Vol. 30, No. 8, p 1173-1175, August, 1978. 2 fig, 2 tab.

Descriptors: *Water wells, *Water valves, *Evaluation, Pumps, Regression analysis, Economics, Corrosion, Damages.

Increased use of ground water in mining and agriculture has created a need for practical, scientific methods of evaluating water wells and indentifying conditions which will become major concerns in repair and maintenance. Natural and man-made causes of physical damage to wells are identified. Factors which contribute to corrosion are discussed. Erosion due to suspended solids, seismic effects, and subsidence are other damaging factors. The rate of well deterioration varies with type of formation penetrated, water quality, chemical composition, drilling methods, well development, and well completion materials. Economic factors should also be considered. Good quality water is a valuable resource. Value is also influenced by the location of the well relative to a municipal water supply, its yield and the cost of producing a unit quantity of water. Proper evaluation of pumping equipment depends considerably on length of service and duty cycle. Power and maintenance costs are directly related to the duty cycle. Methods of water well evaluation are generally derived by statistical sampling of the cost of a number of similar wells. Plotting these values and applying regression analysis provides a reasonable formula for estimating the cost of constructing and equipping a well of similar design. (Purdin-NWWA)
W79-01102

FLUID DEVELOPMENT FOR DRILLING SLOUGHING AND HEAVING SHALES,
Amoco Production Co., Tulsa, OK.
For primary bibliographic entry see Field 8G.
W79-01104

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Science, London, (England).
J. B. Day , K. Rowe, M. Price, and T. K. Tate.
Journal of Institute of Water Engineers and Scientists, Vol. 32, No. 4, p 329-340, July, 1978. 8 fig, 1 tab, 3 ref.

Descriptors: *Drilling, *Boreholes, *Well development, Fractures(Geologic), Aquifer, Effective radius, Water yield, Water quality, Economics.

The development of water wells by drilling intersecting inclined bores ('rakers') is described. Rakers would simply enlarge the effective radius of the central well in a homogeneous aquifer, but in a fractured-rock aquifer they would greatly increase the yield by intersecting and connecting fractures. A raker well was modelled and tested in a sand tank under various water table levels. The yield of the central well increased about one-third and drawdown was reduced by about 50 percent. Engineering and hydrogeologic factors governing the choice of raker well configuration are discussed. In a field test on fractured chalk at Lyng, Norfolk, three rakers were drilled at 45 degrees using conventional rotary drilling methods. They intersected a central well about 31 m below the average level of the water table. Variable-rate pumping tests were made after drilling the central well and after drilling of each raker. The total effect of the three rakers was to increase the yield, for a drawdown of 20 feet, by 120 percent. Water quality parameters of discharge samples from the central well are tabulated. The economics of constructing a faker well system is compared with that of other methods of development. Inclined drilling may boost the yield of existing wells under suitable hydrogeologic conditions. (Purdin-NWWA)
W79-01107

USING LARGE DIAMETERS TO INCREASE WELL STORAGE,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 65-66, November, 1978, 1 tab.

Descriptors: *Water storage, *Water tanks, *Wells, Well yield, Pumped storage, Water supply, Dewatering, Water demand.

Low yield wells requires some form of storage. Storage system design is based on estimates of present and future water demands. The best storage area is the well itself. A well's storage capacity can be increased by drilling larger diameters. Water system pressure tanks, can also help provide storage as well as prevent rapid cycling of the pump motor. The size of the tank is determined by well yield, pump capacity, maximum water requirement and operating pressure. In some cases, both a large diameter well and an oversized pressure tank may be required. Light industry and agriculture require greater well yields and storage volumes. Water is pumped from the well into above ground non-pressurized tanks. Water levels in low yield wells must be carefully controlled to avoid dewatering. This can be accomplished by using solenoid activated pump switches attached to water level sensors in the well or by reducing the pump motor speed below the well's production capacity. (Purdin-NWWA)
W79-01109

DRILLING LARGE DIAMETER WELLS: THE PROOF IS IN THE PLANNING,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 72-73, November, 1978.

Descriptors: *Wells, *Drilling, Design, Construction, Gravels, Rotary drilling.

The steps involved in bidding for, site testing, and construction of large diameter wells are described. Bidding requires a thorough knowledge of local geology and water quality. Potentially difficult drilling conditions mandate higher bids. A completed large municipal well will usually bring a price between $250,000 and $500,000. Once test holes have been completed by a driller and their results interpreted by a geologists, an engineer begins designing the wel. Once well design is complete, the drilling manager is ready to plan his strategy. An example is given of a large diameter gravel pack well drilled with a Failing-JED reverse rotary rig. A 61-inch, multi-layered roller cone bit was used to a depth of 38 feet. The borehole was cased with 3/8 inch standard steel. Drilling continued using a 54-inch reverse rotary bit. Number 3 (1/4 inch X 1/8 inch) gravel was used from the base of the 54-inch borehole to 55 feet below the surface. Atop the gravel pack material extending into the 61-inch casing, a mixture of medium sand and Aqua-Gel formed an impervious seal to a depth of 30 feet. (Purdin-NWWA)
W79-01110

REGIONAL GEOLOGY SERIES: PART X,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W79-01115

THE EXPANDING GEYSERS,
For primary bibliographic entry see Field 4B.
W79-01116

DRIFT VELOCITY OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01139

REAERATION PERFORMANCE OF STEPPED CASCADES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-01249

CONTROL OF TRANSIENTS IN SERIES CHANNEL WITH GATES,
Adelaide Univ. (Australia). Dept. of Civil Engineering.
W. E. Bodley, and E. B. Wylie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Proceedings Paper 14101, Vol. 104, No. HY10, p 1395-1407, October 1978. 15 fig, 11 ref, 2 append.

Descriptors: *Hydraulic transients, *Gate control, *Reservoirs, *Open channel flow, *California, Irrigation, Aqueducts, Hydraulics, Flow control, Channels, *Underflow gates, *Gate stroking, Controlled flow.

The concept of controlled flow in open channels had been applied previously to a single channel with a control gate at each end. The reported study applied this concept of 'gate-stroking' to a channel consisting of a number of pools in series. It has been shown that the motions of all control gates in such a channel can be 'designed' such that a change in channel discharge and depth are effected in a prescribed manner at any selected cross section. Furthermore, when such 'stroking-designed' gate motions are completed, the specified, final, steady discharge exists everywhere in the channel, with no residual disturbance from the transient. The application was illustrated for a series of 3 pools separated by underflow gates. The series of pools originated and terminated in underflow gates, both with reservoir conditions on the other side. (Singh-ISWS)
W79-01255

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
For primary bibliographic entry see Field 2L.
W79-01256

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 437, Price codes: A19 in paper copy, A01 in microfiche. Workshop held Oct. 18-20, 1977, Bethesda, MD: Hydrology Committee United States Water Resources Council, Washington, DC., October 1977. 437 p.

Descriptors: *Conferences, *Reviews, *Dam failure, *Flood routing, *Model studies, Flood waves, Dams, Mathematical models, Mathematics, Flood profiles, Channels, Rivers, Analytical techniques, Analysis, Waves(Water), Bores, Water levels, Theoretical analysis, Dam-break waves.

The Proceedings is a collection of papers summarizing the participants' experiences with modelling dam-break flood waves. Collectively, the papers represent a fairly comprehensive report of the cur-

rent state-of-the-art of modeling dam-break flood waves. Recent concern over the catastrophic effects of flood waves produced by dam failures, such as the Toccoa, Johnstown, Teton, Rapid City,and Buffalo Creek floods, has focused on the need for clearer understanding within the engineering community of existing alternative methods for predicting such phenomena. The Hydrology Committee of the Water Resources Council initiated a workshop to provide a forum for presentation and discussion of alternative methods for predicting dam-break flood waves. Participants were solicited from government agencies, universities, and private consultants. (See W79-01263 thru W79-01278) (Humphreys-ISWS)
W79-01262

THE DAM-BREAK WAVE AND THE BORE COLLAPSE ON A BEACH,
North Carolina State at Raleigh. Dept. of Civil Engineering.
M. Amein.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maruland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 1-16, October 1977. 10 fig, 19 ref.

Descriptors: *Dam failure, *Flood waves, *Mathematical models, *Rivers, Beaches, Analytical techniques, Model studies, Theoretical analysis, Channels, Mathematics, Waves(Water), Bores, Method of characteristics, Dam-break waves.

The movement of the dam-break wave has similarities with the bore collapse on a beach. The bore, a forerunner of the long wave behind it, advances toward the shore as a wall of water, and it changes in height and speed as it advances toward the shore. The positive dam-break wave advances through the downstream wet channel in a similar manner. The wave runup up the dry beach is similar to the dam-break wave on a dry bed. The shallow water equations govern the motion of the dam-break wave and the long waves in the sea. The propagation of long waves has been studied by the method of characteristics. The inception and development of bores are predicted by this method. The entire motion is determined by coupling the jump conditions at the bore to the equations of the characteristics. The same procedure was applied to the dam-break wave in dry and wet channels. The bore at the beach and the initial conditions at the dam site become singular points. Characteristics drawn from the vicinity of the singular point provide details of the water surface profiles for the dam-break wave and also for the wave runup. The effect of friction can be included by the use of a formula relating shear stress to the mean velocity. Numerical examples illustrated the application of the method. (See also W79-01262) (Humphreys-ISWS)
W79-01263

UNSTEADY FLOW ANALYSIS OF DAM-BREAK WAVES,
Wisconsin Electric Power Co., Milwaukee.
S. T. Su.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 18-46, October 1977. 17 fig, 3 tab, 12 ref.

Descriptors: *Dam failure, *Waves(Water), *Unsteady flow, *Mathematical models, Analysis, Analytical techniques, Mathematical studies, Model studies, Flood waves, Theoretical analysis, Flood routing, Flow, Channels, Flash floods, Flood profiles, Dam-break waves, One-dimensional flow.

This paper presented an unsteady flow analysis on the flood waves generated by instantaneous release of a reservoir resulting from a dam failure. A mathematical model based on Dressler's perturbation theory was extended and developed to include channel boundary resistance, cross sectional geometry, and bed slope. Theoretical results obtained from the mathematical model include water surface profiles, mean velocity distributons, and the trajectory of positive wavefront for rectangular, parabolic, and triangular cross sections. Experimental data extracted from literature were compared with theoretical results. The relative significance of channel boundary resistance, cross sectional geometry, and bed slope on the wave motion was determined. Classification of flow regimes as related to local Froude numbers, and time and space was analyzed. A numerical example was given to illustrate the application of the mathematical model. Due to the truncation error in the development of the mathematical model, the channel slope is limited to the nearly horizontal channel slope. (See also W79-01262) (Humphreys-ISWS)
W79-01264

FLOOD PLAIN INUNDATION CAUSED BY DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
J. O. Blanton, III.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, DC p 47-64, October 1977. 10 fig, 1 tab, 5 ref.

Descriptors: *Dam failure, *Waves(Water), *Flood routing, *Flood profiles, *Idaho, Flood plains, Flooding, Analytical techniques, Hydrograph analysis, Mathematical models, Model studies, Analysis, Rivers, Flood waves, *Snake River(Idaho), *Teton Dam(Idaho), Dam-break waves, Hydrologic routing.

Predictions of flood plain inudation due to dam failure are required occasionally when time, money, or data are not available for more sophisticated analyses involving solution of the unsteady-flow equations in open channels. Recognizing the limitations, failure hydrographs were routed through the valley downstream by means of an implicit-finite difference methods. The procedure consists of a mass balance of inflow, outflow, and change in storage per unit of time within a reach. The average hydraulic properties for all subreaches were computed from the best data available and used in the routing. Possible backwater effects caused by valley constrictions were checked by steady-flow backwater computations in which the attenuated peak flows from the flood routing were applied at appropriate valley sections. Flood elevations were adjusted upward if indicated. The results indicated that an application of the mass continuity principle alone, as in a hydrologic routing, is quite inadequate for modeling the rapidly changing flow characteristics just downstream from a dam break. The routing improves in reliability as the speed of the flood wave decreases. (See also W79-01262) (Humphreys-ISWS)
W79-01265

SIMPLIFIED ROUTING THROUGH RESERVOIR,
Federal Energy Regulatory Commission, Washington, DC.
For primary bibliographic entry see Field 4A.
W79-01266

FLOODS FROM BREACHING OF DAMS,
Nunn, Snyder and Associates, Fairfax, VA.
F. F. Snyder.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 75-88, October 1977. 3 fig, 2 tab, 3 ref.

Descriptors: *Dam failure, *Flood routing, *Discharge(Water), *Analytical techniques, Rivers, Reservoirs, Hydrographs, Flood profiles, Flood waves, Peak discharge, Hydrograph analysis, Methodology, *Teton Dam(Mont), Dam-break waves.

The hydrograph computations are accomplished in 3 stages after definition of a geometric shape aapproximating cross sections for the dam and reservoirs. The initial discharge and depth of outflow for the observed or assumed breach are computed first. Next, the volume of the failure wedge of the reservoir and time of emptying are computed and used to define the variation of discharge and depth of flow during that period of time so as to recede to the capacity of the breach for normal conditions of discharge and depth of flow. The final phase consists of computing the recession of the outflow from the remaining slope reservoir storage. The outflow hydrograph is routed to downstream points of interest using reservoir-type storage, lineal or variable, and a translation lag time. The Teton Dam and Reservoir were used to illustrate the application of the procedures presented. (See also W79-01262) (Humphreys-ISWS)
W79-01267

UNSTEADY FLOW MODELING OF DAM-BREAK WAVES,
Tennessee Valley Authority, Knoxville.
J. T. Price, G. W. Lowe, and J. M. Garrison.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 89-130. October 1977. 31 fig, 8 ref.

Descriptors: *Dam failure, *Flood waves, *Peak discharge, *Mathematical models, Model studies, Unsteady flow, Flood routing, Discharge(Water), Rivers, Reservoirs, Analytical techniques, Hydrographs, Dam-break waves.

The techniques used by TVA in computing flood waves generated by tota or partial failures of large dams were described, and comparisons were made with dam-break theory and with computational results of other investigators using different methods. The influence of breach width on the dam-break wave in a rectangular channel was described for both the frictional and non-frictional cases. Finally, some recent applications of the methods to the TVA system were described. The main conslusions from these studies were: (1) Use of the gradually varied flow equations provides a practical engineering solution for obtaining the complete hydrographs from a failed structure. (2) Starting conditions for the connected reservoirs at the failed dam net point can be estimated from the dam-break and critical-flow equations. (3) Peak outflow obtained using the classical dam-break equations and peak outflow obtained with the mathematical model are in remarkable agreement. (4) For partial dam failures, separate reservoir models are required. The outflow hydrograph must be obtained by using as a downstream boundary condition a rating curve developed by model studies or anlaytical methods for the geometry of the failed section. (See also W79-01262) (Humphreys-ISWS)
W79-01268

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
R. J. Brown, and D. C. Rogers.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977 Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington D.C., p 131-163, October 1977. 15 fig, 18 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Idaho, Computer programs, Mathematical model, Analytical techniques, Analysis, Discharge(Water), Hydrographs, Hydrograph analysis, Flood waves, Flood profiles, Rivers, Peak discharge, *Teton Dam(Idaho), Dam-break waves, Method of characteristics.

Two digital computer programs were utilized to simulate the hydraulic events during and following the Teton Dam failure. The first program routes a flood past a dam using the storage equation and considers the effects of an inflow hydrograph and the operation of powerplants, spillways and outlet works. This program can calculate a progressive

erosion (breach) if an earth dam is overtopped, and can simulate a piping failure condition. This program was used to simulate the events at the Teton Dam site and to calculate the outflow hydrograph during the failure. The second program, TAHS (Transient Analysis of any Hydraulic System), is a general purpose program used to solve the unsteady-flow equations in open channels, closed conduits, or combinations of both. This program was used to route the outflow hydrograph from Teton Dam to American Falls Reservoir. The results of this study were compared with the high water inundated area recorded by USGS. (See also W79-01262) (Humphreys-ISWS)
W79-01269

THE DEVELOPMENT AND TESTING OF A DAM-BREAK FLOOD FORECASTING MODEL,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
D. L. Fread.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 164-197, October 1977. 12 fig, 29 ref, 1 append.

Descriptors: *Flood forecasting, *Dam failure, *Mathematical models, *Flood routing, *Idaho, *West Virginia, Theoretical analysis, Model studies, Analytical techniques, Mathematical studies, Flood profiles, Discharge(Water), Equations, Methodology, Hydrograph analysis, Hydrographs, Rivers, Peak discharge, Numerical analysis, *Teton Dam(Idaho), *Buffalo Creek(WVa), Dam-break waves, Model testing.

The theoretical aspects of a mathematical model to forecast the flood hydrograph resulting from a breached dam were presented. The model is composed of two basic elements. The first simulates the outflow hydrograph due to a time-dependent, erosion-type breach of a dam using a hydraulic weir representation of the outflow through the breach while simultaneously considering the effects of the reservoir storage depletion and the inflow hydrograph via either a storage or dynamic routing technique. The second element routes the generated outflow hydrograph through the downstream valley via an implicit finite difference solution of the complete one-dimensional equations of unsteady flow. Essential input data consists of: (1) the geometrical and temporal description of the breach; (2) the reservoir depth, length, and either storage-elevation or top width-elevation tables; and (3) the Manning roughness coefficient-elevation and top width-elevation tables for the downstream valley. The model was applied to the dam-break floods which resulted from the failures of the Teton Dam and the Buffalo Creek coal-waste dam to test the model's ability to reconstitute observed downstream peak stages, discharges, and travel times. Simulation accuracy, computer requirements, input parameter sensitivies, and numerical computational characteristics were presented for each of the applications. (See also W79-01262) (Humphreys-ISWS)
W79-01270

CALCULATING AND ROUTING THE TETON DAM-BREAK FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
W. A. Thomas
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 198-227, October 1977. 6 tab, 2 ref, 14 plate.

Descriptors: *Dam failure, *Flood routing, *Mathematical models, *Idaho, Flood profiles, Flood waves, Peak discharge, Discharge(Water), Rivers, Reservoirs, Hydrographs, Hydrograph analysis, Analytical techniques, Analysis, Model studies, Methodology, *Teton Dam(Idaho), *Snake River(Idaho), Dam-break waves

The generalized computer program, 'Gradually Varied Unsteady Flow Profiles,' was used to calculate the outflow hydrograph at the partially breached Teton Dam and to route that flood hydrograph downstream for a distance of 30 miles. The time of arrival of the flood wave, the time of the maximum water surface elevation, and the time of recession were calculated, as well as discharge, water surface elevations, and velocity hydrographs at intervals of about 2 miles through the 30-mile routing reach. The analysis used data such as topographic maps, aerial photography, dam description, gaged stream flows, and reservoir elevation-capacity curves, generally available in the study of the impact of a dam-break flood. Gradually varied, unsteady-flow routing techniques have the capability to calculate the outflow hydrograph at a breach as well as to route that hydrograph downstream. The peak discharge at the breach is very sensitive to the size and rate of development of the breach; however, attenuation of the flood hydrograph rapidly eliminates differences in water surface elevations as the wave moves downstream. The n-values do not significantly affect the peak water elevation except near the dam; however, time of arrival is sensitive to n-values. Variation in topography appears to be a very significant parameter in the calculation of peak flood elevations. (See also W79-01262) (Humphreys-ISWS)
W79-01271

COMPARATIVE ANALYSIS OF ROUTING TECHNIQUES FOR THE FLOODWAVE FROM A RUPTURED DAM,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
T. Strelkoff, D. Schamber, and N. Katopodes.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 228-291, October 1977. 32 fig, 31 ref. NSF ENG 73-04233 A01.

Descriptors: *Dam failure, *Model studies, *Flood waves, *Reviews, Flood routing, Water levels, Mathematical models, Analytical techniques, Hydrographs, Flood profiles, Discharge(Water), Hydraulic models, Methodology, Dimensional analysis, Bores, Rivers, Dam-break waves.

The results of 5 different approaches to the numerical modelling of flooding from a breached or ruptured dam were compared with each other and with experimental data obtained in rectangular flumes by the Army Corps of Engineers in 1960-61. Total instantaneous failure of the entire dam as well as vertical breaches comprising from 6% to 60% of the dam (and valley) width were investigated. Extremely smooth (Manning $n = 0.009$) and extremely rough (n approximately 0.05) boundaries were considered. Of the 5 mathematical models, 2 comprised solutions to the Saint-Venant equations: one solution was a fully second-order method of characteristics applied to specified time lines, and the other was a two-step, implicit-explicit scheme devised by Vasiliev. The results of these 2 models agreed between themselves and with much of the experimental data; and, thus, were viewed as standards against which the results of simpler models could be compared. These simpler models consisted of (1) an implicit application of integrated zero-inertia equations (Saint-Venant equations with all acceleration terms deleted) to finite elements of the floodwave; (2) a normal-depth kinematic-wave model, essentially identical to modified-Puls routing in a long, prismatic channel; (3) same as 2, but with a kinematic-shock profile fitted at the front. Results of a sixth model, fully two-dimensional in plan, were given for one of the Corps tests of a breached dam. Accuracy of the simpler schemes depends strongly on a characteristic Froude number based on reservoir depth and hypothetical normal velocity at that depth. Agreement improves with smaller breaches. (See also W79-01262) (Humphreys-ISWS)
W79-01272

QUALITATIVE COMPARISON OF THREE DAM BREAK ROUTING MODELS,
Sutron Corp., Arlington, VA.
T. N. Keefer, and R. K. Simons.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D. C., p 292-311, October 1977. 8 fig, 4 tab, 17 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Flood waves, Mathematical models, Hydrographs, Discharge(Water), Water levels, Peak discharge, Analytical techniques, Rivers, Open channels, Dam-break waves, Finite difference technique, Modified Puls Method, Multiple linearization technique, Uniform channels.

Hypothetical dam-break-like waves routed through 5- and 25-mile reaches of rectangular and nonrectangular channels. Routing was done by the linear implicit finite difference technique, the Modified Puls method, and the Multiple Linearization technique. The finite difference model was used as a standard of comparison. The Modified Puls method does not behave consistently with respect ot finite difference. Comparison of peak stage, peak discharge, and time of peak ranged from high to low by considerable percentages (15 or more). The Multiple Linearization method compares favorably at short distances. The model consistently predicts too great a stage and discharge and too fast travel times (10% or less). In general, the cost of gathering and preparing input data far exceeds computer cost. Thus, there seems to be little excuse for not using a finite difference model in most anayses. (See also W79-01262) (Humphreys-ISWS)
W79-01273

DAM-BREAK FLOOD WAVE COMPUTATION BY METHOD OF CHARACTERISTICS AND LINEARIZED IMPLICIT SCHEMES,
Geological Survey, NSTL Station, MS. Gulf Coast Hydroscience Center.
C-l. Chen, and L. A. Druffel.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 312-345, October 1977. 11 fig, 28 ref.

Descriptors: *Dam failure, *Flood waves, *Mathematical models, *Flood routing, Numerical analysis, Model studies, Mathematical studies, Equations, Analytical techniques, Analysis, Rivers, Water levels, Discharge(Water), Peak discharge, Methodology, *Dam-break waves, Method of characteristics, Finite difference model.

Two numerical techniques for computing dam-break flood waves in nonprismatic channels, with or without a base flow, were investigated. One technique is to formulate an explicit scheme of the characteristics method with specified time intervals and, to use the Rankine-Hugoniot shock equations to trace one characteristic backwards to the known state for the solution of a shock wave. The other technique is to formulate a linearized implicit finite-difference scheme for the solution of the Saint-Venant equations and to compute a shock wave without resorting to the shock equations. Mathematical problems encountered in the computation using both techniques included numerical oscillations or instabilities caused by a large depth difference at the dam, severe channel expansions and contractions, large roughness variations, and singularities both at the leading edge and trailing edge of the surge on a dry bed. A comparison of results obtained from computer experiments indicated that a technique using the method of characteristics scheme works better initially after the dam break, and the other technique works better at later times. Computed data on arrival time of the leading edge of the advancing wave, peak stage, and duration of flood at several points of interest on the river reach were presented. (See also W79-01262) (Humphreys-ISWS)
W79-01274

A NUMERICAL MODEL FOR MULTIDIMENSIONAL UNCONSTRAINED FLOW OVER IRREGULAR TERRAIN,
Energy Inc. Idaho Falls, ID.
K. D. Richert.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 346-353, October 1977. 3 fig, 4 ref.

Descriptors: *Dam failure, *Flood waves, *Numerical analysis, *Mathematical models, Model studies, Equations, Analytical techniques, Analysis, Flood routing, Rivers, Water levels, Methodology, *Teton Dam.

An extension of the MAC (Marker and Cell) method was developed to predict the transient two-dimensiona horizontal flow of water over irregular topography. Special attention was given to the treatment of the leading edge of the flood. The method utilizes a rectangular grid of cells with a totographic elevation specified for each cell. This permits the calculation of the path taken by the flood with no a priori assumptions of flood routing needed. The basic solution procedure involves the solution of a integrated continuity equation and two integrated momentum equations. The integrared equations are similar to the two-dimensional equations of a compressible fluid whose equation of state is a function of a single thermodynamic variable. The integrated continuity equation was used to solve for the height of the fluid as a function of time and positions. The use of the method was demonstrated by a calculation of the flood characteristics resulting from the Teton Dam failure. The sample problem considered the area from the dam site to Sugar City, Idaho. (See also W79-01262) (Humphreys-ISWS)
W79-01275

DAM BREAK FLOOD WAVE ANALYSIS: PROBLEMS, PITFALLS, AND PARTIAL SOLUTIONS,
Hydrocomp, Inc., Palo Alto, CA.
D. D. Franz.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 354-383, October 1977. 6 fig, 29 ref.

Descriptors: *Dam failure, *Flood routing, *Mathematical models, Model studies, Mathematics, Unsteady flow, Analysis, Analytical techniques, Rivers, Hydrographs, Flood profiles, Water levels, Equations, Methodology, Open channels, Peak discharge, Dam-break waves.

Experiences with channel representation, outflow hydrograph estimation, and unsteady flow modeling of dam-break flood waves were related. An internally consistent and convenient channel representation for the top width, area, and first moment of area at a point in the channel was presented. This representation forms an integral part of a representation of the variation of these elements along the channel in a manner which maintains continuous space derivatives. Also outlined was a method for estimating the peak outflow subsequent to an instantaneous failure of a dam of general cross section. A consistent and accurate representation of the Escoffier stage variable forms a part of this method. Possible approaches to estimating the outflow hydrograph for reservoirs encountered in practice also were included. Experiences in the application of the diffusing scheme, the specified time interval method of characteristics, and an implicit box scheme to the modeling of dam break flood waves in non-prismatic channels were shared. Emphasis was given to consistency of approximation and special problems encountered. (See also W79-01262) (Humphreys-ISWS)
W79-01276

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
A. Balloffet.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, DC., p 384-411, October 1977. 10 fig, 8 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Reservoirs, Discharge(Water), Peak discharge, Hydrographs, Analytical techniques, Floods.

Mathematical models used for dam-break routing in natural channels provide adequate descriptions of their response to such massive flooding. The models described were based on a deterministic approach to the solution of the open channel equations; finite difference schemes were used. In any dam-break situation there is a background of natural flood and the increment created by the break. If the break occurs during the probable maximum, flood, the increment may be small in proportion to the natural event. When the study will result in an appraisal of the warning time for downstream population, a realistic analysis should consider a smaller flood, such as the 100-year flood, so that the flood due to the break may be compared to a normal event. Two analyses were presented for comparison of the two criteria. In both cases, explicite finite difference schemes were used for the solution downstream of the reservoir. One of the analyses was made using a 'background' flood with a 100-year return interval, while the maximum probable flood was used for the second. (See also W79-01262) (Humphreys-ISWS)
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
C. B. Cecilio.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 412-433, October 1977. 5 fig, 32 ref, 2 append.

Descriptors: *Dam failure, *Floods, *Mathematical models, *Hydrographs, Flood routing, Theoretical analysis, Hydrograph analysis, Flooding, Discharge(Water), Peak discharge, Rivers, Design criteria, Model studies, Equations, Dam-break waves.

The criteria and procedures in the analyses of hypothetical dam failures were described. The hydraulics and hydrologic concepts involved are useful tools in the planning and design of dams and embankments or siting a proposed power generating plant. This is especially true if the structure is to be located above areas of concern, such as populated cities, or if the failure of the structure can cause excessive damage to life, limb, and properties. This paper was based on experiences of Pacific Gas and Electric Company in the preparation of inundation maps from hypothetical dam failures. Criteria and procedures were described to implement the analyses and mapping in the most judicious and economical way. The method to derive the hydrograph at the failed section and subsequent routing downstream to determine the limits of probable inundation was described. Sophisticated as well as approximate methods in dam failure analyses were discussed as well as their limitation and applicability. The complexity of the work requires excellent judgment and good background in hydraulics and hydrology. Exact mathematical formulas can be attempted to simulate a postulated failure for breach sizes that are based on the engineer's experience and judgment. Therefore, it must be remembered that dam failure analysis is still a scientific art. (See also W79-01262) (Humphreys-ISWS)
W79-01278

8C. Hydraulic Machinery

BORING AND SAMPLING TECHNIQUES,
For primary bibliographic entry see Field 8G.
W79-01103

MUD AND CLAY,
Magcobar Co., Sacramento, CA.
For primary bibliographic entry see Field 8G.
W79-01120

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01230

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES,
Geological Survey, Lubbock, TX. Water Resources Div.
D. C. Signor.
Water-Resources Investigations 78-72 (open-file report), July 1978. 25 p, 6 fig, 4 plates, 2 tab, 5 ref.

Descriptors: *Groundwater, *Water quality, *Sampling, *Methodology, *Pumps, *Specifications, Equipment, Design, Performance, *Gas-driven pump, *Small-diameter pump, Small-diameter wells.

Observation wells installed for artificial-recharge research and other wells used in different groundwater programs are frequently cased with small-diameter steel pipe. To obtain samples from these small-diameter wells in order to monitor water quality, and to calibrate solute-transport models, a small-diameter pump with unique operating characteristics is required that causes a minimum alternation of samples during field sampling. A small-diameter gas-driven pump was designed and built to obtain water samples from wells of two-inch diameter or larger. The pump is a double-piston type with the following characteristics: (1) The water sample is isolated from the operating gas, (2) no source of electricity is ncessary, (3) operation is continuous, (4) use of compressed gas is efficient, and (5) operation is reliable over extended periods of time. Principles of operation, actual operation techniques, gas-use analyses and operating experience are described. Complete working drawings and a component list are included. Recent modifications and pump construction for high-pressure applications also are described. (Woodard-USGS)
W79-01378

SELF-PROPELLED DREDGING APPARATUS,
WMI, Inc., Oklahoma City, OK. (Assignee).
R. H. Vaughn, C. E. Maitlen, G. H. Davis, and R. E. Maitlen.
U.S. Patent No. 4,095,545, 17 p, 14 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, no 3, p 952, June 20, 1978.

Descriptors: *Patents, *Dredging, *Equipment, Floating, Hydraulic systems, Slurries, Aquatic weeds.

A floating dredging apparatus is described which is provided with means for self-propulsion and for pumping large quantities of water and water/solid slurries. Advantages of this system include an improved dredging head mechanism which withdraws material from the bed of a body of water more efficiently and engages, chops and disposes of weeds, vegetation and other fibrous material encountered. The apparatus also has alternate means of self-propulsion and employs steerable,

water jet propulsion means for moving the apparatus for substantial distances free of the constraints of cable propulsion. (OEIS - Sinha)
W79-01389

8D. Soil Mechanics

APPROXIMATE CALCULATION OF NONSTATIONARY TEMPERATURE REGIME OF A ROCK-ICE DAM.
N. V. Ukhova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047-594, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 663, November 1977. 16 p, 3 fig, 9 ref. Translated from Trudy Koordinatsionnykh Soveshchanii po Gidrotekhnike, Vol. 23, p 160-172, 1965.

Descriptors: *Rockfill dams, *Ice, *Permafrost, *Dam foundations, Temperature, Thermal properties, Thawing, Freezing, Structures, Hydraulic structures, Dams, Cold regions, Cold weather construction, Earth dams, *USSR, Frozen dams, Rock-ice dams.

These Studies concern development of principles for calculating nonstationary temperature regimes of rock-ice dams. (Sims-ISWS).
W79-01049

ORGANIZATION OF FULL-SCALE ANALYSES OF FILTRATION-THERMAL REGIME OF TAILINGS DAMS ON PERMAFROST FOUNDATIONS,
G. M. Sheynfeldt.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041-432, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 626, July 1977. 12 p, 6 fig, 1 tab. Translated from Russian.

Descriptors: *Permafrost, *Arctic, *Dams, *Dam foundations, Waste dumps, Mine wastes, Mining, Filtration, Cold regions, Cold weather construction, Thermal properties, Sediments, Temperature, Piezometers, Piezometry, Construction, Structures, Earth dams, *USSR, Tailings dams, Tailings dumps.

The planning and operation of tailings dump dams under arctic conditions have been carried out until the present time without standard documents or recommendations that consider the specific features of the climatic and permafrost conditions. This report presented an analysis of several tailings dump dams located in severe climates as well as a discussion of the use of piezometers. The conclusions presented substantially justify calculation-theoretical forecasting of the formation of the temperature mode of the tailings sediment and dam foundation. (Sims-ISWS)
W79-01050

TAILINGS COFFERDAMS ON PERMAFROST FOUNDATIONS IN YAKUTSKAYA ASSR,
G. I. Kuznetsov, and S. V. Zaslavskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 254, Price codes A02 in paper copy, A01 in microfiche. CRREL Draft Translation 629, July 1977. 10 p, 6 fig, 1 tab. Translated from Russian.

Descriptors: *Cofferdams, *Permafrost, *Dam foundations, Filtration, Seepage, Thawing, Temperature, Waste dumps, Mine wastes, Cold regions, Cold weather construction, Construction, Dams, Structures, Earth dams, *USSR, Tailings dams, Tailings dumps.

This report provided an analysis of problems of the design, construction, and operation of tailings dumps on permafrost foundations. Analysis of data from engineering surveys, planning documents, and features of the operation of tailings dumps provided an opportunity to evaluate the permafrost-geomineralogical features of the foundations of dams. (Sims-ISWS)
W79-01051

A PROBABILISTIC ANALYSIS OF EMBANKMENT STABILITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
L. W. Gilbert.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 579, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper S-77-10, July 1977. 152 p, 36 fig, 6 tab, 36 ref, 1 append.

Descriptors: *Embankments, *Bank stability, *Soil strength, *Model studies, Mathematical models, Probability, Stability, Soils, Clays, Levees, Flood control, Analytical techniques, Engineering, Civil engineering, Soil science, Soil mechanics.

A probabilistic model was developed to predict the reliability of an embankment constructed on soft saturated clay. The model was based on a circular arc method of analysis, supplemented with a measure of the uncertainty in the resisting and in the overturning moments. The uncertainty in the overturning moment was considered negligible. The uncertainty in the resisting moment was considered due to the uncertainities of bias, random testing error, and inherent soil variability. Two case studies were analyzed by both the conventional method of analysis and the probability model. The results indicated that the uncertainties in bias correction factors ae the dominant sources for both field vane testing and unconfined compression testing. The basic probability model was extended to include the effect of embankment length on the computed failure probability. Two approaches were taken. The first was a direct extension of the basic model, considering the actual embankment length as a multiple of the minimum embankment length required to satisfy the assumption of 'plane strain.' The second approach was a three-dimensional probability model developed from a first passage failure criterion. (Sims-ISWS)
W79-01054

8E. Rock Mechanics and Geology

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
For primary bibliographic entry see Field 8G.
W79-01057

8G. Materials

FIRST INSPECTIONS HIGHLIGHT US DAMS THREAT.
World Water, Vol. 1, No. 2, p 19-22, June 1978. 5 fig.

Descriptors: *Dams, *Dam failure, *Inspection, Hazards, Safety, Flooding, Legal aspects, Disasters, Failures, Structures, Hydraulic structures, Impoundments, Washouts, Engineering, Civil engineering, *Dam inspections.

In the first 5 nonths of 1978, 11 American reservoirs have been hurriedly emptied becasuse the dams impounding them have been declared dangerously defective and their failure would result in the loss of 'more than a few lives and extensive property damage. Another 29 so-called 'high hazard' dams have been condemned as unsafe by engineers carrying out nationwide inspections--almost 6 years after they were ordered to do so by Congress. In each case, the dams were being inspected for the first time in many years, most of them for the first time ever. Alarming though these statistics may seem, most observers are convinced that they are only the tip of an iceberg, and that when the Corps of Engineers finishes its first-phase inspections of the nation's 9,000 high-hazard dams in 5 years (only 592 inspctions had been started by the end of May), several hundreds will face huge repair of replacement costs to remove the risk of disastrous failure. There is also a high statistical probability that a number will fail before the inspectors arrive (America has had more than 100 major dam failures since 1930). (Sims-ISWS)
W79-01048

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
M. M. Dembo, and L. G. Guthrie.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 253, Price codes: A04 in paper copy, A01 in microfiche. Volume 11 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 65 p, 20 fig, 9 ref, 4 append.

Descriptors: *Earthquake engineering, *Earthquakes, *Dynamics, Structures, Engineering structures, Buildings, Dams, Hydraulic structures, Structural engineering, Structural stability, Structural behavior, Structural analysis, Civil engineering, Computers, Computer models, Design, Structural design, Conferences, *Computer-aided design.

Two papers were contained in this volume: Earthquake and Dynamic Analysis for Military Structures - The relation between the lateral force design procedures presented in 'Seismic Design for Buildings' (TM 5-809-10) and those of more rigorous dynamic analyses were presented. For the bulk of military structures, i.e., low, one- to three-story buildings, the design procedures given in the TM are valid. The limitations on the use of the TM and other similar codes were presented, particularly where functional considerations of the building are important. Trends in development of procedures for seismic design of buildings were discussed with emphasis on the response spectrum method. State-of-the-Corps Art in Earthquake and Dynamic Analyses for Civil Works Structures - The conventional seismic coefficient method for the seismic design of concrete gravity dams is being supplemented by procedures coupling the computed dynamic response of the structure with the estimated future ground motion for the area. At present, both methods should be used to check the designs of new and existing hydraulic structures in high risk seismic zones. So far, precise standards have not been established for designating design earthquakes for an area or for defining the requirements for a structure's dynamic performance. This paper reviewed the present earthquake design procedures, which involve computing inertial, hydrodynamic, and dynamic earth forces. (Sims-ISWS)
W79-01057

BORING AND SAMPLING TECHNIQUES,
P. H. Nowlan.
Drilling News, Vol. 3, No. 2, p 17-25, Winter, 1978. 3 ref, 2 append.

Descriptors: *Drilling, *Boreholes, *Sampling, *Cores, Rotary drilling, Auger drilling, Wash boring, Samplers.

Boring methods are grouped into two categories, destructive and non-destructive. Destructive methods include: rotary percussion, auger, and wash-boring. Rotary core drilling is the only non-destructive method. Variations of the destructive methods along with their applications, advantages, and limitations are discussed in detail. Rotary core drilling is used for the collection of accurate data rather than drilling holes quickly and economically. Core samples from good rock are relatively undisturbed samples. Disturbed samples, obtained a products of destructive drilling methods, are suitable only for strata identification. Distortion and contamination of samples are caused by difficult sampling conditions, and lack of preservation and

handling precautions. Three samples: the Shelby thin wall tube sampler, the stationary piston sampler, and the Denison sampler are described and the applications and advantages of each are listed. The common feature of all three samplers is that they all recover a sample by pushing a thin tube into cohesive soil. Proper operation procedures for sampling various types of material are discussed. Data needed to be recorded during the drilling of rotary percussion holes is listed and common core barrel, core and casing sizes are tabulated. (Purdin-NWWA)
W79-01103

FLUID DEVELOPMENT FOR DRILLING SLOUGHING AND HEAVING SHALES,
Amoco Production Co., Tulsa, OK.
O. B. Anderson, and C. D. Edwards.
Petroleum Engineer, Vol. 49, p 105-116, September, 1977. 7 tab.

Descriptors: *Drilling fluids, *Shales, Hydraulics, *Stabilization, Inhibition, Salts, Coatings, Rolling tests, Methylene blue test, Gilsonite.

Rolling tests were developed to simulate exposure of shales to various additives and mud systems. Shales were classified by measuring cation exchange capacity using a methylene blue test (MBT). Factors to consider in developing a fluid for sloughing shale include: drilling fluid properties, hydraulics, time of exposure, and formation being drilled. The best material for preventing shale disintegration is flaxmeal. Various salts were found to improve initial shale recovery. As salt content increases, viscosity also increases and fluid loss decreases. If inhibiting salts are added to coating agents, hydration and swelling decrease. There is a minimum amount of potassium ions and a minimum ratio of potassium ion to sodium ion required for maximum shale stability. Reactivity of shale as measured by the MBT can be used to determine whether a coating agent or an inorganic salt is more important for stability. Gilsonite aids shale stability with its high softening point (400 degrees F) and its chemical attraction to shale solids. Samples of shales from various parts of the world were examined to determine the validity of the conclusions made from rolling tests. (Purdin-NWWA)
W79-01104

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
For primary bibliographic entry see Field 3C.
W79-01106

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 2F.
W79-01111

A LOOK AT RPM PLASTIC,
Water Well Journal, Vol. 30, No. 11, p 79-80, November, 1978. 1 tab.

Descriptors: *Plastic pipes, *Well casings, Wells, Installation, Corrosion, Reinforcement.

Reinforced plastic motar (RPM) well casing has been used in water wells where corrosion resistance, long service life and larger diameters are required. It is also ideal for ground water monitoring wells and injecton wells. RPM casings are available in a variety of ring stiffness combinations, with varying hoop and axial strengths to withstand the strain of installation and subsurface conditions up to 1000 feet. RPM tension well casing has a high axial tensile strength and a low-profile locking key joint. Tension casing differs from compression casing in that its wall has greater axial glass additions and it is easier to install. Neither compression nor tension casing require cement grouting. However, most wells should be cemented, grouted, or sealed to protect the supply against pollutions. (Purdin-NWWA)
W79-01114

MUD AND CLAY,
Magcobar Co., Sacramento, CA.
C. Ruggles.
Pacific Grandwater Digest, Vol. 1, No. 1, p 11-12, September, 1978.

Descriptors: *Drilling fluids, *Clays, *Rotary drilling, Erosion control, Protective coatings, Filter cakes, Circulation loss, Additives, Gels, Cements, Drilling.

The purpose of clay in the drilling industry is to carry cuttings, reduce hole erosion, reduce fluid loss to the formation, and deposit a filter cake. The amount of clay needed to carry cuttings varies with the pump output. To stop hole erosion, either increase the clay thickness or decrease pump output or both. The purpose of the wall cake is to lower fluid loss and help support loose sands. Too thick a cake results in sticky holes and low production. Thick filter cakes are due to weight climb as a result of not removing cuttings. They can also be caused by lime, salt, excessively hard water and cold temperatures. Lime, salt and hard water can be corrected with a fluid loss additive like Kwik Drill or Soda Ash. Gel diesel fuel 2 and occasionally cement can be used to stop lost circulation. Gel is also used when cementing off blow holes, sloughed sand zones, etc. Gel should be mixed in a hopper with a 1/2-inch nozzle or jet. Feed the hopper with gel at a rate of 25 lb. per minute and at a pump pressure over 300 psi. (Purdin-NWWA)
W79-01120

HIGH-TEMPERATURE SOLUBILITIES OF CALCIUM SULFATE HEMIHYDRATE AND ANHYDRITE IN NATURAL SEAWATER CONCENTRATES,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W79-01128

POTENTIODYNAMIC STUDIES OF ANTIMONY IN ACIDIC AND ALKALINE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
L. L. Wikstrom, and K. Nobe.
Corrosion, Vol 31, No. 10, p 364-369, October 1975. 14 fig, 6 ref, (California Water Resources Center Seawater Desalination Program).

Descriptors: *Corrosion, *Polarization, Desalination, *Antimony, Acidic solution, Alkaline solutions.

Potentiodynamic polarization of antimony in acidic and alkaline solutions had been investigated. In acidic solutions, two transition potentials were observed at about the equilibrium potentials of the Sb/Sb203 and the Sb203/Sb205 reactions. Both anodic ad cathodic Tafel behavior was observed for these reactions. The anodic ad cathodic Tafel slopes are 100 and 150 mV/decade, respectively, for the Sb203/Sb205 reaction. For the latter, the cathodic reaction is first order and the anodic reaction is zero order with respect to the hydrogen ion concentration. A mechanism for the Sb203/Sb205 reaction is proposed which is consistent with the experimental kinetic data. In alkaline solutions, only the Sb/Sb203 reaction was observed. In both acidic and alkaline solutions the differential capacitance of active antimony is substantially larger than the differential capacitance of passive antimony. (Snyder- Calif, Davis)
W79-01232

POLARIZATION AND PHOTOPOTENTIALS OF INSB IN NAOH,
California Univ., Los Angeles. School of Engineering and Applied Science.
R. E. Patterson, D. A. Chance, and K. Nobe.
Corrosion, Vol. 31, No. 7, p 243-246. July 1975, 10 fig, 10 ref, (California Water Resources Center Desalination Project S-144).

Descriptors: *Corrosion, *Anodes, *Polarization, Desalination, Antimony, *Photopotentials.

The anodic dissolution of the (111)-Sb surface in 1N NaOH was at a slightly higher rate compared to the (111)-In surface. On the other hand, the rate of hydrogen evolution was slightly higher on (111)-In than on (111)-Sb. Anodic dissolution was not affected by illumination prior to passivation. However, photopotentials as high as 0.1 V were observed after the InSb was anodized at passivating currents. The magnitude of the photopotentials decreased during the potential decay after anodization was completed. The spectral response of the photopotentials after attainment of steady state corrosion potentials was determined. The fifferential capacitance at the corrosion potential prior to anodization was 35 uF/cm2. Immediately after anodization, the capacitance was 0.6 uF/cm2 and then increased to about 2.2 uF/cm2 at the end of the potential decay. Both the photopotentials and small capacitance values were due to the film formed during anodization. (Snyder- Calif, Davis)
W79-01233

ELECTRODISSOLUTION OF NICKEL IN MOLTEN LICL-KC1,
California Univ., Los Angeles. School of Engineering and Applied Science.
D. L. Piron, S. Asakura, and K. Nobe.
Journal of the Electrochemical Society, Vol. 123, No. 4, p 503-506, April 1976. 8 fig, 8 ref. (California Water Resources Center Seawater Desalination Program).

Descriptors: *Saline water, *Corrosion, *Molten salts, Anodic dissolution, Desalination, *Nickel, Chloride compounds, Diffusion coefficients.

The electrodissolution of nickel in molten eutectic LiC1-KC1 has been investigated by quasi-steady-state potentiostatic and transient polarization techniques. The results indicate that electrodissolution is diffusion controlled. In addition, anodic passivation behavior is observed. Passivation is surmised to be due to the deposition of a chloro-nickel complex. Diffusion coefficients of Ni(II) have been determined from the chronoamperometric and chronopotentiometric data and found in accord with values reported in the literature. (Snyderf-Calif, Davis)
W79-01234

HYDROGEN EVOLUTION AND CORROSION BEHAVIOR OF FE-NI ALLOYS IN H2SO4 - EFFECT OF TEMPERATURE, C1- AND BENZATRIAZOLE,
California Univ., Los Angeles. School of Engineering and Applied Science.
D. Altura, and K. Nobe.
Corrosion, Vol. 32, No. 2, p 41-47, February 1976. 14 fig, 3 tab, 19 ref. (California Water Resources Center Seawater Desalination Project).

Descriptors: *Corrosion, *Alloys, *Polarization, Desalination, Hydrogen sulfide, Temperature, Chloride ions, Benzatriazole, *Iron-nickel alloys.

The corrosion of iron-nickel alloys in deaerated 1N H2SO4 in the absence and presence of chloride ions and benzotriazole (BTA) between 23 to 75C has been investigated. A marked decrease in the corrosion rate of the uninhibited alloys in the absence and presence of chloride ions was observed as the iron content decreased from pure iron to 60% Fe at all temperatures. On the other hand, below 60% Fe the corrosion rate of the alloys did not differ as substantially. Apparent activation energies for corrosion of Fe-Ni alloys in 1 N H2SO4 decrease with increase in nickel content. Benzotriazole was an effective corrosion inhibitor of the Fe-Ni alloys in 1N H2SO4 even at 75C. (Snyder-Calif, Davis)
W79-01235

ELECTROCHEMICAL BEHAVIOR OF ROTATING IRON DISKS EFFECT OF FE(111),

California Univ., Los Angeles. School of Engineering and Applied Science.
R. F. Tobias, and K. Nobe.
Journal of Electrochemical Society: Electrochemical Science and Technology Vol. 122, No. 1, p. 65-70. January 1975, 12 fig, 2 tab, 10 ref. (California Water Resource Center Desalination Project S-144).

Descriptors: *Corrosion, *Polarization, *Diffusion, Coefficients, Electrochemistry, *Iron, Ions.

The electrochemical behavior of iron in deaerated H2SO4 containing ferric ions has been investigated with rotating disk electrodes. The rest potential and corrosion current of iron in IN H2SO4 were not affected by variation in the angular velocity. On the other hand, the rest potential, E(m), and corrosion current of iron in 1N H2SO4 containing ferric ions varied with the ferric ion concentration, C, and the angular velocity of the iron disk, m. Em followed the relation Em = constant + 0.040 log C + 0.020 log m, volts The corrosion current of iron increased in the presence of ferric ions and was controlled by the diffusion of ferrric ions. Diffusion coefficients of ferric and ferrous ions were determined: DFe(111) = 5.2+0.3X10-6 and DFe(11)=6.5+0.4X10-6 cm2/sec. (Snyder-Calif, Davis)
W79-01281

METHOD FOR SEQUESTERING METAL IONS,
Benckiser-Knapsack G.m.b.H., Ladenburg am Neckar (West Germany) (Assignee).
For primary bibliographic entry see Field 5G.
W79-01417

8I. Fisheries Engineering

FISH LADDER FOR CHARLES RIVER DAM, CHARLES RIVER, MASSACHUSETTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
L. Z. Perkins, and P. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 184, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 157-1, December 1977. 62 p, 38 fig, 1 tab.

Descriptors: *Fish ladders, *Dams, *Model studies, *Hydraulic models, Hydraulic structures, Weirs, Fish passages, Fish handling facilities, Fish management, Fish migration, Rivers, Flow, Laboratory tests, Hydraulic engineering, *Charles River(Mass).

The design of a fish ladder that would operate with downstream tide fluctuations of 14 ft and upstream river fluctuations of 1 ft were developed in two hydraulic models. The hydraulic design of the ladder was developed in a 1:8-scale model. Hydraulic characteristics of a false weir at the upstream end of the ladder were studied in a 1:4-scale model. The ladder was intended to pass primarily shad and alewives. The initial fish ladder was of the vertical-slot type, with 29 pools and a false weir above high tide level to lead fish into a steep chute to the river 6.5 ft below. The design was hydraulically satisfactory. The design was modified to include a direct swim-through exit to the river for use during low and intermediate tides. The low tide ladder section consisted of 5 pools, with notched weirs and a weir gate exit. The false weir exit was designed to operate with all tide levels, but fish were to be blocked from that section by a barrier rack during use of the low tide exit. In a further modification, the notched weirs of the low tide section were replaced with a submerged screen barrier that would force fish toward the surface for better public viewing. With that plan, the false weir exit operated only when the low tide exit was closed. All the plans were satisfactory. The plan with a false weir exit and a low tide exit with submerged barrier screen was selected for construction. (Sims-ISWS)
W79-01052

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-01210

10. SCIENTIFIC AND TECHNICAL INFORMATION

10F. Preparation Of Reviews

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

SUBJECT INDEX

ABSORPTION
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

ACID MINE WATER
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

ACID PRECIPITATION
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

ACID TREATMENT
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

ACIDIC SOILS
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

ACIDS
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

ACOUSTICS
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

ACTIVATED CARBON
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

ACTIVATED SLUDGE
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

ADJUDICATION PROCEDURE
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

ADMINISTRATIVE AGENCIES
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

ADMINISTRATIVE DECISIONS
Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

ADSORPTION
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

AEROBIC DIGESTION
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

AEROBIC TREATMENT
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

AGGREGATED OXISOL
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

AGRICULTURAL WATERSHEDS
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

AIR POLLUTION
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

AIR POLLUTION EFFECTS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

ALASKA
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

ALCOHOLS
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

ALDRIN
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

ALFALFA
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

ALGAE
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

Calcification and Its Role Among the Macroalgae,
W79-01097 2I

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

ALGAECIDES
Algaecidal Composition,
W79-01401 5F

ALGORITHMS
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

ALKALIS (BASES)
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

ALLOYS
Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, C1- and Benzatriazole,
W79-01235 8G

ALTERNATIVE PLANNING
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

ALUMINUM
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

AMBERLITE XAD-2 RESIN
Recovery of Nitrosamines from Water,
W79-01006 5D

AMERICAN COOTS
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

AMERICAN SHAD
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

AMMONIA
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

AMMONIUM OXIDATION
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

ANACYSTIS NIDULANS
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

ANAEROBIC BACTERIA
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

ANAEROBIC CONDITIONS
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

ANALYSIS
A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

ANALYTICAL TECHNIQUES
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Floods from Breaching of Dams,
W79-01267 8B

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

ANIMAL BEHAVIOR
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

ANIMAL PHYSIOLOGY
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

ANIMAL POPULATIONS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

ANIMAL WASTES (WILDLIFE)
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

ANION EXCHANGE
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

ANODES
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

ANODIC STRIPPING VOLTAMMETRY
Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

ANTIBACTERIAL SUBSTANCES
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

ANTIMONY
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

APPLICATION EQUIPMENT
Adjustable Height Sprinkler,
W79-01411 3F

APPLICATION RATES
Relation of Water Absorption to Duration o Application in Furrow Irrigation,
W79-01094 3F

APPROXIMATION METHOD
Simplified Routing through Reservoir,
W79-01266 4A

AQUACULTURE
Suspension-Feeding Aquaculture Systems: Ef fects of Phytoplankton Concentration and Tem perature on Growth of the Bay Scallop,
W79-01285 5C

AQUATIC ALGAE
Effect of Complexation by Natural Organic L gands on the Toxicity of Copper to a Unicellula Alga, Monochrysis Lutheri,
W79-01449 5C

AQUATIC HABITATS
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

AQUATIC INSECTS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

AQUATIC MACROPHYTE
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

AQUATIC MICROORGANISMS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

AQUATIC PLANTS
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

AQUATIC POPULATIONS
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

AQUATIC WEED CONTROL
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

AQUATIC WEEDS
Fresh-Water Weeds are a Resource,
W79-01197 5C

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

AQUEDUCTS
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

AQUICULTURE
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

Waste Heat Aquaculture,
W79-01467 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

AQUIFER CHARACTERISTICS
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

AQUIFER MANAGEMENT
Regional Ground-Water Management,
W79-01105 4B

The Legalization of Groundwater Shortage,
W79-01142 6E

National Water Commission Views Groundwater Protection,
W79-01155 5G

AQUIFERS
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

ARCTIC
Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

ARIZONA
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ARKSHELL
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

ARSENIC COMPOUNDS
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

ASBESTOS
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

ASH
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

ASSAY
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

ASSESSMENT
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

ASTERIONELLA SOCIALIS
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

ATCHAFALAYA BASIN FLOODWAY
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

ATLANTIC SALMON
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

ATMOSPHERIC CONTRIBUTIONS
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

ATOMIC ABSORPTION SPECTROSCOPY
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

ATPASE
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

ATTENUATION
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

AUSTRALIA
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

AUTOMATION
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

AUTONOMOUS MODELS
Renewable Resource Management and Extinction,
W79-01495 6A

AVERAGE RUNOFF
Runoff from Hydrologic Units in Florida,
W79-01368 7C

BACTERIA
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

BALDCYPRESS
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

BANK STABILITY
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

BARCHAN DUNES
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

BARGES
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

BARNACLES
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BARRIER ISLANDS
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

BASS
Nitrogen Fertilization of Ponds,
W79-01439 5C

BATHYMETRY
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

BDELLOVIBRIOS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

BEACH EROSION
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

BEAUFORT SEA
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

BEN'S CREEK (PENN)
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

BENEFICIAL USE
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

Fresh-Water Weeds are a Resource,
W79-01197 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

BENTHIC CONTRIBUTIONS
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

BENTHIC FAUNA
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

BENTHOS
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

BENZENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BHAKRA DAM (INDIA)
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

BIALGAL ASSAY
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

BIG THOMPSON RIVER (COLORADO)
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

BILHARZIA
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

BIO-REGENERATION
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

BIOACCUMULATION
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

BIOASSAY
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

BIOAVAILABILITY
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

BIOCHEMICAL OXYGEN DEMAND
Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

BIOCIDES
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

BIOCONTROL
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

BIODEGRADATION
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

BIOGEOCHEMICAL CYCLES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

BIOINDICATORS
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

BIOLOGICAL COMMUNITIES
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

BIOLOGICAL MEMBRANES
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

BIOLOGICAL POLLUTION
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

BIOLOGICAL TREATMENT
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

BIOLOGICALLY ACTIVE METALS
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

BIOLOGY
Inland Wetland Definitions,
W79-01335 6E

BIOMASS
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

BIOTA
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

BIRDS
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

BLACKWATER RIVER
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

BLEACHING WASTES
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

BOGS
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Interrelation of Forest and Bog.
W79-01297 2H

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

BOGS *DRYING
Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

BONDING
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

BONNEMAISONIA ASPARAGOIDES
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

BOREHOLES
Boring and Sampling Techniques,
W79-01103 8G

The Use of Inclined Boreholes for Well Development,
W79-01107 8B

BRACKISH WATER
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

BREAKWATERS
Breakwater,
W79-01400 8A

BREEDING
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

BREWING INDUSTRY
The Response of Firms to Pollution Charges,
W79-01499 5G

BROOK TROUT
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

BRYOPHYLLUM-CALYCINUM
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

BUFFALO CREEK (WVA)
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

BURNING
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

CADMIUM
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

CADMIUM

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

CALCAREOUS ALGAE
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALCAREOUS SOILS
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALCIUM HYDROXIDE
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

CALCIUM SULFATE
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

CALIFORNIA
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

Groundwater Law: More Questions Than Answers,
W79-01118 6E

The Legalization of Groundwater Shortage,
W79-01142 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

Control of Transients in Series Channel with Gates,
W79-01255 8B

Land Subsidence in the Santa Clara Valley,
W79-01365 2F

CANADA
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

The Response of Firms to Pollution Charges,
W79-01499 5G

CAPITAL SUPPLY
Viewpoint from the Capital Market,
W79-01488 6B

CARBON DIOXIDE
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

CARCINUS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

CARP
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

CARRYING CAPACITY
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

CATFISHES
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

CATHODES
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

CATION EXCHANGE
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

CATIONS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

CENTRIFUGATION
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

CESIUM
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

CHAETOCEROS ARMATUM
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

CHANNA PUNCTATUS
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

CHANNEL IMPROVEMENT
Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

CHANNEL MORPHOLOGY
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

CHANNEL SHRINKAGE
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

CHANNELIZATION
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

CHARLES RIVER (MASS)
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

CHELATION
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

CHEMCONTROL
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

CHEMICAL ANALYSIS
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CHEMICAL BUDGET
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CHEMICAL OXYGEN DEMAND
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

CHEMICAL PRECIPITATION
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating In-

dustry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

CHEMICAL WASTES
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

CHEMISTRY ANALYSIS
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

CHESAPEAKE BAY
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

CHINOOK SALMON
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

CHLORINATED HYDROCARBON PESTICIDES
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

CHLORINATION
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

CHLORINE
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

CHOWAN RIVER (NC)
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

CHROMATOGRAPHY
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

CHROMIUM
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

CLAMS
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

CLARK FORK RIVER (MONT)
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

CLASSIFICATION
Inland Wetland Definitions,
W79-01335 6E

CLAYS
Mud and Clay,
W79-01120 8G

CLOUD SEEDING
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

CLOVERS
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

COAGULATION
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

COAL MINE WASTES
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

COAL MINES
The Industry's Role in Energy Management,
W79-01484 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

COALS
Coordinated Energy Management,
W79-01479 6B

The Industry's Role in Energy Management,
W79-01484 6B

COASTAL MARSHES
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

COASTAL STRUCTURES
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

COASTAL ZONE MANAGEMENT
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

COASTS
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

COBALT
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

COFFERDAMS
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

COLLOIDAL ORGANIC MATTER
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

COLOR
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

COLORADO
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

COLORADO FRONT RANGE
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

COLORADO MINERAL BELT
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

COLORADO RIVER
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

COLORADO RIVER BASIN
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

Energy and the Colorado River,
W79-01167 3E

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

COLUMBIA COUNTY
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

COLUMBIA RIVER
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

COMMERCIAL FISH
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

COMMERCIAL SHELLFISH
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

COMMUNITY DEVELOPMENT
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

COMPLEXATION
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

COMPLEXING CAPACITY
Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

COMPREHENSIVE PLANNING
Energy and the Colorado River,
W79-01167 3E

COMPUTER-AIDED DESIGN
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

COMPUTER MODELS
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

CONFERENCES
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

CONNECTICUT
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CONNECTICUT RIVER
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

CONSERVATION
Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

CONSTITUTIONAL LAW
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

CONSTRUCTION
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

CONTINENTAL SHELF
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

CONTROL
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

COPEPODS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

COPPER
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

COPPER COMPOUNDS
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

COPPS BROOK WATERSHED (CONN)
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

CORALVILLE RESERVOIR (IA)
Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

CORD GRASS
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

CORES
Boring and Sampling Techniques,
W79-01103 8G

CORN (FIELD)
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

CORRELATION ANALYSIS
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

CORROSION
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Method for Sequestering Metal Ions,
W79-01417 5G

COST ALLOCATION
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

COST ANALYSIS
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

COST-BENEFIT ANALYSIS
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

COSTS
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

The National Energy Plan,
W79-01480 6B

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

CRABS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

CRIME
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

CRITHIDIA
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

CROP PRODUCTION
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

CRUSTACEANS
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

CRYSTALLIZATION
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

CYANOPHYTA
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

CYCLING NUTRIENTS
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

CYCLOPOIDS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

CYPRESS TREES
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

DAILY HYDROGRAPHS
Generation of Daily Precipitation Over an Area,
W79-01261 2B

DAM-BREAK WAVES
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

DAM CONSTRUCTION
Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

DAM FAILURE
First Inspections Highlight US Dams Threat.
W79-01048 8G

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Floods from Breaching of Dams,
W79-01267 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

DAM FOUNDATIONS
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

DAM INSPECTIONS
First Inspections Highlight US Dams Threat.
W79-01048 8G

DAMAGES
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

DAMS
First Inspections Highlight US Dams Threat.
W79-01048 8G

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

DANDENONG CREEK (AUSTRALIA)
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

DATA COLLECTIONS
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

DATING
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

DDT
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

DECIDUOUS FORESTS
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

DECISION MAKING
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

Coordinated Energy Management,
W79-01479 6B

An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

DECOMPOSING ORGANIC MATTER
The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

DEFIBERING
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

DEGRADATION (DECOMPOSITION)
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

DELAWARE
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

DELAWARE BAY
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

DELAWARE RIVER
Organic Compounds in the Delaware River,
W79-01252 5B

DELAWARE RIVER BASIN
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

DENSITY
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

DEPURATION
Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

DESALINATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

DESALINATION APPARATUS
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

DESALINATION PLANTS
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

DESALINATION PROCESSES
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

DETRITUS
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

DEVILS LAKE BASIN (ND)
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

DEWATERING
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

DIALYSIS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

DIALYSIS SAMPLER
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

DIAPAUSE
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

DIAPTOMIDS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

DIBASOL
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

DIFFUSION
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

DIGESTION
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

DIPN
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

DIPTERA
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

DISCHARGE (WATER)
Floods from Breaching of Dams,
W79-01267 8B

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

DISINFECTION
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

DISPERSION
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

Mixing and Dispersion in Estuaries,
W79-01338 5B

DISSOLVED CHEMICAL CONSTITUENTS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

DISSOLVED ORGANIC CARBON FLUXES
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

DISSOLVED OXYGEN
Reaeration Performance of Stepped Cascades,
W79-01249 5G

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

DISSOLVED SOLIDS
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS CONCENTRATIONS
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS DISCHARGE
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS LOAD
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOVED OXYGEN
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

DISTILLATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

DISTRIBUTION PATTERNS
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

DISTRICT HEATING
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

DIURNAL
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

DOMESTIC WASTES
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Waste-Water Treatment System,
W79-01420 5D

DONNAN DIALYSIS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

DRAINAGE
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

DRAINAGE CONTROL
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

DRAINAGE EFFECTS
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

DRAINAGE PRACTICES
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

DREDGE SPOILS
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

DREDGING
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Self-Propelled Dredging Apparatus,
W79-01389 8C

DRIFT VELOCITY
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

DRILLERS LOGS
Well Logs...Are They Really Necessary,
W79-01119 7C

DRILLING
Boring and Sampling Techniques,
W79-01103 8G

The Use of Inclined Boreholes for Well Development,
W79-01107 8B

Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

Regional Geology Series: Part X,
W79-01115 2F

The Expanding Geysers,
W79-01116 4B

DRILLING FLUIDS
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

Mud and Clay,
W79-01120 8G

DRINKING WATER
A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

DRYING
About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

DUCKWEED
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

DUNES
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

DYNAMIC MODELS
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

DYNAMICS
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

E. COLI
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

EARTHQUAKE ENGINEERING
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

EARTHQUAKES
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

ECOLOGICAL DISTRIBUTION
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

ECOLOGICAL MODELLING
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

ECOLOGY
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

Interrelation of Forest and Bog.
W79-01297 2H

ECONOMIC DEVELOPMENT
Critique of the Challenges,
W79-01486 6B

ECONOMIC EFFECTS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

ECONOMIC IMPACT
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

ECONOMIC VALUE
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ECONOMICS
Inland Wetland Definitions,
W79-01335 6E

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

Viewpoint from the Capital Market,
W79-01488 6B

Critique and Challenges,
W79-01490 6B

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

Renewable Resource Management and Extinction,
W79-01495 6A

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

ECOTONE
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

EDTA
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

EFFECTS
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

EFFLUENT STREAMS
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

EGG DEVELOPMENT
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

ELECTRIC POWER PRODUCTION
Viewpoint from the Capital Market,
W79-01488 6B

ELECTROCHEMISTRY
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

ELECTRODIALYSIS
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

ELECTROLYSIS
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

ELECTRON MICROSCOPY
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

ELECTRON SPIN RESONANCE
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

ELODEA
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

ELUTRIATION
Nonmetallic Elutriation and Sieving Device for Benthic Macrofauna,
W79-01447 5G

EMBANKMENTS
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

EMPETRUM NIGRUM
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

EMPLOYMENT
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

ENDANGERED SPECIES
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

ENERGY
Energy and the Colorado River,
W79-01167 3E

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Critique and Challenges,
W79-01490 6B

ENERGY BUDGET (TAMARISK)
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

ENGINEERING STRUCTURES
Breakwater,
W79-01400 8A

ENGLAND
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

ENTERIC VIRUSES
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

ENTOMOLOGY
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

ENVIRONMENT
Fragile Lands and People,
W79-01487 6B

Critique and Challenges,
W79-01490 6B

ENVIRONMENTAL CONTROL
Metallic Mining Reclamation Act,
W79-01188 6E

ENVIRONMENTAL EFFECTS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

ENZYMES
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

EQUATIONS
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

EQUIPMENT
Self-Propelled Dredging Apparatus,
W79-01389 8C

EROSION
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

EROSION CONTROL
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

ESTIMATED COSTS
Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

ESTIMATING
Annual Catchment Losses-A Practical Method,
W79-01248 2D

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

ESTUARIES
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

ESTUARIES *MIXING
Mixing and Dispersion in Estuaries,
W79-01338 5B

ESTUARINES
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

EUTROPHICATION
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

EVACUATION
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

EVALUATION
A Water Well Evaluation System,
W79-01102 8H

Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Oil Pollution Liability.
W79-01173 6E

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

EVALUATION ANALYSIS
Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

EVAPORATION
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

EVAPORATORS
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

EVAPOTRANSPIRATION
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

Annual Catchment Losses-A Practical Method,
W79-01248 2D

EXPLOITATION
Seabed Resources and International Law,
W79-01158 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

EXPLOSIONS
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

EXPLOSIVES
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

EXTINCTION
Renewable Resource Management and Extinction,
W79-01495 6A

FALLOUT
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

FARM PONDS
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

FARM WASTES
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

FATTY-ACID
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

FEDERAL GOVERNMENT
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

Oil Pollution Liability.
W79-01173 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

The National Energy Plan,
W79-01480 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

FEDERAL JURISDICTION
Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

FEDERAL WATER POLLUTION CONTROL ACT
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

FEEDLOTS
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

FEEDS
Fresh-Water Weeds are a Resource,
W79-01197 5C

FERMENTATION
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

FERROUS IRON
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

FERTILIZATION
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Nitrogen Fertilization of Ponds,
W79-01439 5C

FERTILIZERS
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

FILTERS
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

FILTRATION
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

FINANCING
Viewpoint from the Capital Market,
W79-01488 6B

FINITE ELEMENT ANALYSIS
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

FISH
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

FISH BEHAVIOR
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

FISH CULTURE
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

FISH DISEASES
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

FISH ESTABLISHMENT
Waste Heat Aquaculture,
W79-01467 5C

FISH FARMING
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

Waste Heat Aquaculture,
W79-01467 5C

FISH HATCHERIES
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

FISH HATCHERY
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

FISH LADDERS
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

FISH PHYSIOLOGY
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

FISH PONDS
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

FISH POPULATIONS
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

FISH PRODUCTION
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

FISHERIES RESOURCES
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

FISHKILL
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

FLASH EVAPORATION
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

FLASH FLOODS
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

FLOCCULATION
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLOOD DAMAGE
Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

FLOOD FORECASTING
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

FLOOD PLAIN ZONING
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

FLOOD PROFILES
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

FLOOD RECURRENCE INTERVAL
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

FLOOD ROUTING
Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Simplified Routing through Reservoir,
W79-01266 4A

Floods from Breaching of Dams,
W79-01267 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

FLOOD WAVES
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

FLOODING (INTERMITTENT)
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

FLOODS
Simulation of Flood Waves in Channels,
W79-01060 2E

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

FLORAL LISTS
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

FLORIDA
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

Runoff from Hydrologic Units in Florida,
W79-01368 7C

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

FLORIDA AQUIFER
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

FLOW FRICTION
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

FLOW MEASUREMENT
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

FLUORAPATITE
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLUORIDES
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLUORINE
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

FLY ASH
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

FOG
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

FOOD CHAINS
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

FOOD HABITS
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

FOOD PROCESSING INDUSTRY
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

FOOD WEBS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

FORECASTING
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

FOREST WATERSHEDS
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

FORESTS
Interrelation of Forest and Bog.
W79-01297 2H

FOSSIL FUELS
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System.
W79-01458 5C

FREEZING PROCESSES
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

FRESHWATER FISH
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

FROGS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

FUEL OIL
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

FUTURE PLANNING (PROJECTED)
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

GAMMA RAYS
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

GAS-DRIVEN PUMP
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GATE CONTROL
Control of Transients in Series Channel with Gates,
W79-01255 8B

GATE STROKING
Control of Transients in Series Channel with Gates,
W79-01255 8B

GEOCHEMISTRY
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

GEOGRAPHICAL REGIONS
Runoff from Hydrologic Units in Florida,
W79-01368 7C

GEOLOGIC INVESTIGATIONS
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

GEOLOGY
Regional Geology Series: Part X,
W79-01115 2F

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GEOMORPHOLOGY
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

GEORGIA
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

GEOTHERMAL STUDIES
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

The Expanding Geysers,
W79-01116 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

GERMINATION
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

GOALS
Critique of the Challenges,
W79-01486 6B

Critique and Challenges,
W79-01490 6B

GRAN'S PLOT
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

GRANTS
How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

GRAPHICAL METHODS
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

GRASS SHRIMP
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

GREAT BLUE HERON
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

GREAT BRITAIN
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

GREAT PLAINS
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Fragile Lands and People,
W79-01487 6B

GREAT SALT LAKE
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

GREEN SWAMP AREA (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GROUND WATER
Regional Geology Series: Part X,
W79-01115 2F

Groundwater Law: More Questions Than Answers,
W79-01118 6E

GROUNDWATER
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation.
W79-01053 8B

Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GROUNDWATER AGE

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

GROUNDWATER MOVEMENT

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

GROUNDWATER RECHARGE

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

GROUNDWATER RESOURCES

The Management of Groundwater Supplies,
W79-01117 4B

Well Logs...Are They Really Necessary,
W79-01119 7C

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GROWTH HORMONES

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

GROWTH RATES

Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

GULF COAST

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GULF OF MEXICO

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GULLS

Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

HABITATS

Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

HAIL

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

HALOBATES

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

HANFORD RESERVATION (WASH)

Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

HARVESTING

Fresh-Water Weeds are a Resource,
W79-01197 5C

HAWAII

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

HAZARDS

The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

HEAT TRANSFER

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

HEAT TRANSMISSION

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

HEATINGM

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

HEAVY METAL COMPOUNDS

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

HEAVY METAL REMOVAL

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

HEAVY METALS

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

HELIX POMATIA

Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

HELLS CANYON

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

HERRING
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

HIGHWAY CONSTRUCTION
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

HIGHWAYS
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

HISTORY
The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

HOME RANGES
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

HORMONES
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

HUMAN POPULATION
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

HUMAN RESOURCES
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

HUMATES
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

HUNTING
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

HYDRAULIC CONDUCTIVITY
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

HYDRAULIC JUMP
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

HYDRAULIC MODELS
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

Reaeration Performance of Stepped Cascades,
W79-01249 5G

HYDRAULIC TRANSIENTS
Control of Transients in Series Channel with Gates,
W79-01255 8B

HYDROELECTRIC POWER
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

HYDROGEN
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

HYDROGEN ION CONCENTRATION
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

HYDROGEN SULFIDE
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

HYDROGEOLOGY
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

HYDROGRAPH ANALYSIS
Simplified Routing through Reservoir,
W79-01266 4A

HYDROGRAPHS
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

HYDROLOGIC BUDGET
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

HYDROLOGIC CYCLE
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

HYDROLOGIC DATA
Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

HYDROPONICS
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

ICE
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

IDAHO
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

ILLINOIS
State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

INCINERATION
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

INCINERATOR RESIDUE
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

INDIA
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

INDIAN RESERVATION
Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

INDIANA
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

INDICATORS
A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

INDUSTRIAL POLLUTION
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

INDUSTRIAL PRODUCTION
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

INDUSTRIAL WASTE
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

INDUSTRIAL WASTES
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Treating Paint Waste Solids,
W79-01416 5D

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

INDUSTRIAL WATER
Purification of Water for Boiler,
W79-01405 5F

INDUSTRIES
The Industry's Role in Energy Management,
W79-01484 6B

INFRARED RADIATION
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

INHIBITION
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

INHIBITORS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

INJECTION
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

INLAND WATERWAYS
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

INLAND WETLAND DEFINITIONS
Inland Wetland Definitions,
W79-01335 6E

INORGANIC TRACE ANALYSIS
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

INPUT-OUTPUT ANALYSES
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

INPUT-OUTPUT ANALYSIS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

INSECTICIDES
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

INSPECTION
First Inspections Highlight US Dams Threat.
W79-01048 8G

INSTITUTIONAL CONSTRAINTS
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

Critique and Challenges,
W79-01490 6B

INSTITUTIONS
Water Quality: Problems and Research Needs,
W79-01348 6B

INSTRUMENTATION
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

INSURANCE
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

INTERTIDAL AREAS
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

INVERTEBRATES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

ION EXCHANGE
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh

udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

Water Purification Process,
W79-01404 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

ION SELECTIVE MEMBRANES
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

IOWA
Little River, Iowa, Watershed Project.
W79-01175 6E

Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

IOWA RIVER
Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

IRON
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

IRON AND STEEL INDUSTRY
Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

IRON COMPOUNDS
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

IRON-NICKEL ALLOYS
Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

IRRADIATION
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

IRRIGATION
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Water Conduit,
W79-01390 3F

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

Adjustable Height Sprinkler,
W79-01411 3F

IRRIGATION EFFICIENCY
Water Conduit,
W79-01390 3F

IRRIGATION PRACTICES
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Water Conduit,
W79-01390 3F

IRRIGATION SYSTEMS
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

IRRIGATION TIMING
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

IRVINE (CALIF)
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

ITERATION
The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

JAPAN
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

JELLY FISH
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

JUDICIAL DECISIONS
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

JURISDICTION
Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

KELTHANE
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

KOHL SPRING (MO)
Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

KOREA
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

KUM RIVER (KOR)
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

LABORATORY TESTS
Reaeration Performance of Stepped Cascades,
W79-01249 5G

LAKE BIWA (JAPAN)
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

LAKE KINNERET (ISRAEL)
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

LAKE MICHIGAN
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

LAKE ONTARIO
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

LAKE PAIJANNE (FINLAND)
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

LAKE SANGCHRIS (ILLINOIS)
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

LAKE SEDIMENTS
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

LAKE SUPERIOR
Organic Contaminants,
W79-01471 5C

LAKE TOYA (JAPAN)
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

LAKE WINDERMERE
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

LAKES
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

LAND
Fragile Lands and People,
W79-01487 6B

LAND CLASSIFICATION
Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

LAND CLEARING
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LAND DISPOSAL OF SLUDGE
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

LAND RECLAMATION
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

LAND RESOURCES
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

LAND SUBSIDENCE
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

LAND TENURE
Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

LAND TREATMENT
Proceedings of a Symposium on Land Treatment of Waste Effluents Center of Adult Education, University of Maryland, April 25-26, 1978.
W79-01329 5D

LAND USE
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Inland Wetland Definitions,
W79-01335 6E

Fragile Lands and People,
W79-01487 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

LAND USE REGULATION
Inland Wetland Definitions,
W79-01335 6E

LARVAE
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

LAW OF THE SEA
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Seabed Resources and International Law,
W79-01158 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

LAYERED BEDS
Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

LEACHATE
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

LEACHING
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

LEAST SQUARES METHOD
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

LEGAL ASPECTS
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Inland Wetland Definitions,
W79-01335 6E

LEGAL DEFINITION
Inland Wetland Definitions,
W79-01335 6E

LEGISLATION
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

Oil Pollution Liability.
W79-01173 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

State Waters-General Provisions.
W79-01183 6E

Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

Inland Wetland Definitions,
W79-01335 6E

LIGANDS
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

LIGHT
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

LIGNINS
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

LIME
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

LIME-ALGAE SLUDGE
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

LIMITED IRRIGATION
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

LIMITING FACTORS
Observations on Algal Populations and Experimental Maturation Pond System.
W79-01196 5D

LIMNOLOGY
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

LIQUID WASTES
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

LITTLE TENNESSEE RIVER VALLEY (TN)
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

LITTLE WITHLACOOCHEE RIVER (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

LIVING FILTER SYSTEM
Wastewater Recycling on Forest Lands,
W79-01424 5D

LOCAL GOVERNMENTS
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

LOGGING
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LOGGING PRACTICES
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LOGGING (RECORDING)
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

LONG-TERM PLANNING
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

LOTIC ENVIRONMENT
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

LOUISIANA
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

LOW FLOW
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

LUMBRICULUS
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

MACOMA
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

MACROINVERTEBRATES
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

MALLARD DUCKS
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

MAMMALS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

MANAGEMENT
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

Water Quality: Problems and Research Needs,
W79-01348 6B

Coordinated Energy Management,
W79-01479 6B

The Industry's Role in Energy Management,
W79-01484 6B

MANCOS SHALE
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

MANGANESE
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

MANGROVE SWAMPS
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

MANKYUNG RIVER (KOR)
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

MAPS
Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

MARINE ALGAE
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

MARINE BACTERIA
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

MARINE BIOLOGY
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

MARINE FISH
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

MARINE INSECTS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

MARSH PLANTS
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

MARSHES
Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

MASS TRANSFER
The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

MATHEMATICAL MODELS
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

The Response of Firms to Pollution Charges,
W79-01499 5G

MATHEMATICAL STUDIES
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

MATURATION PONDS
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

MEADOW VOLE
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

MEANDERS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

MECHANICALLY GENERATED WAVES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

MEMBRANE PROCESSES
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

MEMBRANES
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

MENIDIA
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

MERCURY
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

MERCURY RECOVERY
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

METABOLISM
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

METAL DEPOSITION KINETICS
Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

METAL PLATING WASTES
Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

METALLURGY
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

METALS
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

METHANE
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

METHODOLOGY
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

MICROBIAL DEGRADATION
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

MICROBIAL METABOLISM
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

MICROORGANISMS
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

MICROWAVES
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

MILFOIL
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

MILLSTONE POINT (CONN)
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

MINE DRAINAGE
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

MINE EFFLUENTS
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

MINE WASTES
Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

MINING
Metallic Mining Reclamation Act,
W79-01188 6E

MINING ENGINEERING
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

MINNESOTA
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

MIRES
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

MISSISSIPPI
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

MISSISSIPPI RIVER
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

MISSOURI
Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

MIXING
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake.
W79-01199 5C

MODEL STUDIES
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

Simulation of Flood Waves in Channels,
W79-01060 2E

Generation of Daily Precipitation Over an Area,
W79-01261 2B

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

MOLLUSKS
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

MOLTEN SALTS
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

MONITORING
Waste Source Investigations, Kingsport, Tennessee
W79-01208 5B

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

MONSOD SYSTEM
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

MONSOONS
Geochemical Implications of Summer Monsonal Rainwater Composition Over India,
W79-01039 2K

MONTANA
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

MORTALITIES
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

MORTALITY
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

MOSQUITOFISH
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

MOSS
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

MUCK SOILS
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

MUD
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

MULCHING
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

MULTI-STATE INSTITUTIONS
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

MULTIPLE-PURPOSE RESERVOIRS
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

MUNICIPAL SEWAGE SLUDGE INCINERATOR ASH
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

MUNICIPAL WASTES
How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

MUNICIPAL WATER
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

MUSSELS
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

MUTAGENS
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MYCOBACTERIA
The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

NAPHTHALENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

NARRAGANSETT BAY (RI)
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

NARTHECIUM OSSIFRAGNUM
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

NATIONAL ENERGY PLAN
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

NATIONAL ENVIRONMENTAL POLICY ACT
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

NATIONAL INCOME
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

NATIONAL PARKS
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

NATIONAL WATER COMMISSION
National Water Commission Views Groundwater Protection,
W79-01155 5G

NATURAL RESOURCES
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Critique of the Challenges,
W79-01486 6B

Fragile Lands and People,
W79-01487 6B

Viewpoint from the Capital Market,
W79-01488 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

Critique and Challenges,
W79-01490 6B

Renewable Resource Management and Extinction,
W79-01495 6A

NAVIGABLE WATERS
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

NEBRASKA
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

NEGOTIATIONS
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

NESTING
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

NETWORK DESIGN
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

NETWORKS
Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

NEUSE RIVER (NC)
Evaluation of Micromolar Complexiometric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

NEW ENGLAND
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

NEW HAMPSHIRE
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

NEW JERSEY
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Organic Compounds in the Delaware River,
W79-01252 5B

NEW MEXICO
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

NEW YORK
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

NIAGARA AQUIFER (WIS)
Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

NICKEL
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

NILE RIVER BASIN
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

NITRATE
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

NITRATES
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

NITRIFICATION
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

NITRIFICATON
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

NITRIFYING BACTERIA
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

NITRITE
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

NITROGEN
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions.
W79-01423 2H

NITROGEN FIXATION
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduc-

tion) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

NITROGEN TRANSFORMATION
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

NITROSAMINES
Recovery of Nitrosamines from Water,
W79-01006 5D

NON-GAME BIRDS
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

NON-RENEWABLE RESOURCES
Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

NONAUTONOMOUS MODELS
Renewable Resource Management and Extinction,
W79-01495 6A

NONPOINT SOURCE LOADING FUNCTION
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

NORTH CAROLINA
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

NORTH DAKOTA
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

State Waters-General Provisions.
W79-01183 6E

NORTH PLATTE RIVER (NEB)
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

NORTHEAST FLORIDA
Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

NUECES RIVER (TEXAS)
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

NUMERICAL ANALYSIS
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

NUTRIENT CYCLES
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

NUTRIENT CYCLING
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

NUTRIENT LOADING MODELS
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

NUTRIENT REMOVAL
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

NUTRIENT REQUIREMENTS
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

NUTRIENTS
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

OCEANS
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

Seabed Resources and International Law,
W79-01158 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

OFFSHORE PLATFORMS
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OIL
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

The National Energy Plan,
W79-01480 6B

OIL BOOMS
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

OIL POLLUTION
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Effluent Oil Collecting Vessel,
W79-01419 5G

OIL SLICK SPREADING
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

OIL SPILLS
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Drift Velocity of Surface Films Over Waves,
W79-01139 5B

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

Oil Pollution Liability.
W79-01173 6E

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

OIL-WATER INTERFACES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

OILY WATER
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

OLD RIVER CONTROL STRUCTURE
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

OLIGOCHAETES
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

ON-SITE DATA COLLECTIONS
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

ON-SITE INVESTIGATIONS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

OPEN CHANNEL FLOW
Control of Transients in Series Channel with Gates,
W79-01255 8B

OPTIMAL FEEDBACK CONTROL
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

OPTIMIZATION
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Renewable Resource Management and Extinction,
W79-01495 6A

OREGON
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

ORGANIC CARBON
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

ORGANIC COMPOUNDS
Organic Compounds in the Delaware River,
W79-01252 5B

Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

Organic Contaminants,
W79-01471 5C

ORGANIC MATTER
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

ORGANIC WASTES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

ORGANOCHLORINE COMPOUNDS
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

OTTER CREEK-DRY CREEK BASIN (NY)
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

OUTFALL SEWERS
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

OVERDRAFT
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

OVERLAND FLOW
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

OWNERSHIP OF BEDS
In Search of Common Nodules at UNCLOS III,
W79-01163 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

OXIDATION
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

OXIDATION LAGOONS
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

OXIDATION-REDUCTION POTENTIAL
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

OXYGEN DEPLETION
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

OXYGENATION
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

OYSTER RIVER (NH)
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

OYSTERS
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OZONATION
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

OZONE
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

PACIFIC COAST REGION
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

PACIFIC NORTHWEST
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

PACIFIC NORTHWEST U.S.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

PACIFIC OCEAN
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

PAINTS (WASTES)
Treating Paint Waste Solids,
W79-01416 5D

PALAEMONETES
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

PALO VERDES (CALIF)
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

PALOUSE PRAIRIE (IDA-WASH)
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

PAMLICO RIVER ESTUARY (NC)
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

PARALICHTHYS
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

PARAMETRIC HYDROLOGY
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

PARR
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

PASSAIC RIVER (NJ)
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

PATENTS
Tidal Sampler,
W79-01388 7B

Self-Propelled Dredging Apparatus,
W79-01389 8C

Water Conduit,
W79-01390 3F

PATENTS

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Water Sterilization Apparatus,
W79-01395 5F

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Breakwater,
W79-01400 8A

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Purification of Water for Boiler,
W79-01405 5F

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

Adjustable Height Sprinkler,
W79-01411 3F

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

Treating Paint Waste Solids,
W79-01416 5D

Method for Sequestering Metal Ions,
W79-01417 5G

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

Waste-Water Treatment System,
W79-01420 5D

PATH OF POLLUTANTS

Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Mixing and Dispersion in Estuaries,
W79-01338 5B

PATHOGENIC BACTERIA

The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

PEAK DISCHARGE

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

PENNSYLVANIA

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Organic Compounds in the Delaware River,
W79-01252 5B

PERFORMANCE

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

PERIDINIUM CINTUM WESTII

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

PERIPHYTON

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

PERMAFROST

Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

PERMEABILITY

Field Permeability Methods for In-Place Leaching,
W79-01111 2F

PERMITS

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

PESTICIDE RESIDUES

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PHENOLS

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

PHOSPHATES

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

PHOSPHORUS

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

PHOSPHORUS REMOVAL

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

PHOTOPOTENTIALS

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

PHOTOSYNTHESIS

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

PHOTOTACTIC BEHAVIOR
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

PHREATOPHYTES
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

PHYSICAL PROPERTIES
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

PHYTOPLANKTON
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

PLANNING
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

Trade Off Analysis in Environmental Decisionmaking: An Alternative to Weighted Decision Models,
W79-01242 6G

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Fragile Lands and People,
W79-01487 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

PLANT GROWTH
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

PLANT PHYSIOLOGY
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

PLANT POPULATIONS
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

PLANT TISSUES
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PLANT VIRUSES
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

PLASTIC PIPES
A Look at RPM Plastic,
W79-01114 8G

PODZOL SOIL
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

POLARAGRAPHIC ANALYSIS
Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

POLARIZATION
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

POLICY
Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

POLITICAL ASPECTS
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

POLLUTANT IDENTIFICATION
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

POLLUTANTS
Organic Contaminants,
W79-01471 5C

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

POLLUTION ABATEMENT
Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

POLLUTION TAXES (CHARGES)
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

POLLUTION TAXES (CHARGES)

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

POLYCHAETES
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

POLYCHLORINATED BIPHENYLS
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

POLYHALOGENATED 1-OCTENE-3-ONES
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

POLYMERS
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

PONDEROSA PINE TREES
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

PONDS
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

PORT VALDEZ (ALAS)
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

PORT VALDEZ (ALASKA)
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

POTABLE WATER
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

POTATOES
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

POTOMAC ESTUARY
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

POWER LINES
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

POWER SYSTEM OPERATION
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

PRE-MANAGEMENT
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

PRECIPITATION (ATMOSPHERIC)
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

Generation of Daily Precipitation Over an Area,
W79-01261 2B

Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

PREDATION
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

PRICE RIVER BASIN (UTAH)
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

PRIMARY PRODUCTIVITY
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

PRIVATE SECTOR
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

PROBABILITY
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

PRODUCTION
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

PRODUCTIVITY
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

PROJECT PLANNING
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

PROTEINS
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

PROTOZOA
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

PRUDHOE BAY AREA (ALAS)
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

PUBLIC HEALTH
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

PUBLIC LANDS
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

PUBLIC SECTOR
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

PUBLIC WATER SUPPLIES
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

PULP AND PAPER INDUSTRY
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

PULP WASTES
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

PUMPS
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

QUABOAG POND (MA)
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

QUACUMQUASIS POND (MA)
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

QUAE YAI RIVER (THAILAND)
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

RADAR
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

RADIOACTIVE WASTES
Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

RADIOACTIVITY EFFECTS
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

RADIOCHROMATOGRAPHY
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

RAILROADS
Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

RAINFAL
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

RAINFALL
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

RAINFALL DISPOSITION
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

RAINFALL-RUNOFF RELATIONSHIPS
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

RANGE MANAGEMENT
Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

REAERATION
Reaeration Performance of Stepped Cascades,
W79-01249 5G

RECLAIMED WATER
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

RECLAMATION
Metallic Mining Reclamation Act,
W79-01188 6E

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

RECREATION
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

RECYCLING
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

REDOX-ACTIVE CHEMICAL
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

REGENERATION
Purification of Water for Boiler,
W79-01405 5F

REGIONAL ANALYSIS
Regional Geology Series: Part X,
W79-01115 2F

REGIONAL DEVELOPMENT
Principles for Water Quality Management,
W79-01165 5G

Energy and the Colorado River,
W79-01167 3E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

Critique of the Challenges,
W79-01486 6B

Viewpoint from the Capital Market,
W79-01488 6B

REGIONAL ECONOMICS
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

REGRESSION ANALYSES
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

REGRESSION ANALYSIS
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

REGULATION
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

REGULATION

Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

REMEDIES

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

REMOTE SENSING

Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RENEWABLE RESOURCES

Renewable Resource Management and Extinction,
W79-01495 6A

RENOVATION

Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

REPLACEMENT REACTIONS

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

RESEARCH PRIORITIES

Water Quality: Problems and Research Needs,
W79-01348 6B

Critique of the Challenges,
W79-01486 6B

Critique and Challenges,
W79-01490 6B

RESERVOIRS

Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Control of Transients in Series Channel with Gates,
W79-01255 8B

Simplified Routing through Reservoir,
W79-01266 4A

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

RESINS

Recovery of Nitrosamines from Water,
W79-01006 5D

Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

RESISTANCE

Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

RESOURCE ALLOCATION

Seabed Resources and International Law,
W79-01158 6E

An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

RESOURCE DEVELOPMENT

Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

RESOURCE EXTRACTION

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

RESOURCE INPUTS

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

RESOURCE SUBSTITUTION

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

RESOURCES DEVELOPMENT

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

RESPIRATION

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

RETURN FLOW

Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

REVEGETATE BITUMINOUS SPOIL BANKS

Wastewater Recycling on Forest Lands,
W79-01424 5D

REVENUE VALUE

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

REVERSE OSMOSIS

Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

REVIEWS

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

RHODE ISLAND

Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

RHYACODRILUS

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

RICE

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

RIGHT-OF-WAY

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

RIO GRANDE RIVER (N MEX)

An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

RIPARIAN RIGHTS

Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

RIVER BASIN DEVELOPMENT
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

RIVER BEDS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

RIVER KHAN (INDORE)
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

RIVERS
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

Organic Compounds in the Delaware River,
W79-01252 5B

The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

RIVERS AND HARBORS ACT
Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

ROCK-FOX RIVER BASIN
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

ROCKFILL DAMS
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

ROCKY MOUNTAIN REGION
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Fragile Lands and People,
W79-01487 6B

ROOTED AQUATIC PLANTS
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

ROOTS
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

ROTARY DRILLING
Mud and Clay,
W79-01120 8G

RUNOFF
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

Runoff from Hydrologic Units in Florida,
W79-01368 7C

RUNOFF FORECASTING
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

SAFETY FACTORS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

SALINE WATER
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

SALINE WATER-FRESHWATER INTERFACES
Mixing and Dispersion in Estuaries,
W79-01338 5B

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

SALINITY
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

SALMANDERS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

SALMON
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

SALT INJURY
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

SALT MARSH
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

SALT MARSHES
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

SALTON SEA (CALIFORNIA)
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

SALTS
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

SAMPLING
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Boring and Sampling Techniques,
W79-01103 8G

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Tidal Sampler,
W79-01388 7B

SAN FRANCISCO BAY
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

SAN FRANCISCO BAY AREA (CALIF)
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

SAN JUAN MOUNTAINS (COLO)
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

SAND DRYING BEDS
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

SAND FILTERS
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

SANDSTONES
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SANTA CLARA VALLEY (CALIF)
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

SAPROBIC SYSTEM
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

SAVANNAH RIVER
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SCALING
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Method for Sequestering Metal Ions,
W79-01417 5G

SCALLOPS
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

SEA ICE
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

SEA-ICE TYPES
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

SEA WATER
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

SEASONAL
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SEASONAL GROWTH (PLANTS)
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

SEAWEEDS
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

SECONDARY EFFLUENT EFFECTS
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

SEDIMENT CONTROL
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SEDIMENT ORGANIC WEIGHT
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SEDIMENT PARTICLE SIZE
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SEDIMENT TRANSPORT
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

SEDIMENT-WATER INTERFACES
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

Water Resources and the Land-Water Interface,
W79-01295 6E

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SEDIMENTARY ROCKS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SEDIMENTATION
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

SEDIMENTATION CONTROL
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

SEDIMENTS
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

SEEPAGE
Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

SELENASTRUM CAPRICORNUTUM
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

SEMI-PERMEABLE MEMBRANES
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

SEMIPERMEABLE MEMBRANES
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

SENSITIVE TETRAZOLIUM
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

SEPARATION TECHNIQUES
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SEPTIC TANKS
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

SERIOLA
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

SETTLING BASINS
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

SEWAGE DISPOSAL
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

SEWAGE EFFLUENTS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

SEWAGE SLUDGE
Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

SEWAGE TREATMENT
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

SEWAGE TREATMENT PLANT
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

SEWER EFFLUENT CHARGES
The Response of Firms to Pollution Charges,
W79-01499 5G

SHALES
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

SHALLOW WATER EQUATIONS
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

SHELL THICKNESS (SNAILS)
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

SHETUCKET RIVER (CONN)
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

SHORE BIRDS
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

SHORES
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

SHRIMP
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

SIERRA MOUNTAINS (CALIF)
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SIEVES
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

SILICA
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SILTING
Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

SILVER
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

SILVERSIDES
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

SIMULATION ANALYSIS
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

SIMULIUM
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

SINKS
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

SIX MILE RUN RESERVOIR (NJ)
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

SLUDGE
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

SLUDGE DIGESTION
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

SLUDGE DISPOSAL
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SLUDGE DISPOSAL
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

SLUDGE TREATMENT
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SMALL ANIMALS (MAMMALS)
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

SMALL-DIAMETER PUMP
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SMALL SCALE TURBULENCE
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

SNAIL DARTER
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

SNAILS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

SNAKE RIVER (IDA)
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

SNAKE RIVER (IDAHO)
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

SNAKE RIVER PLAIN (IDAHO)
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

SNOW
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

SNOWFALL
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SOCIAL IMPACT
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SOCKEYE SALMON
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

SODA LAKES
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

SODIUM ARSENITE
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

SODIUM COMPOUNDS
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

SOFT-WATER BOG LAKE
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SOFT-WATER LAKE
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SOIL ALGAE
Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

SOIL AMENDMENTS
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

SOIL BACTERIA
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

SOIL CONSERVATION
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

SOIL CONTAMINATION EFFECTS
Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

SOIL EROSION
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

SOIL FORMATION
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

SOIL FUNGI
Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

SOIL GASES
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

SOIL STRENGTH
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

SOIL WATER
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

SOIL WATER MOVEMENT
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

SOIL-WATER-PLANT RELATIONSHIPS
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

SOILS
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

SOLAR DISTILLATION
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

SOLAR STILLS
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

SOLID WASTES
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

SOUND WAVES
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

SOUTH CAROLINA
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

SOUTHERN FLORIDA
Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

SOUTHWEST U.S.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

SPARTINA-ALTERNIFLORA
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

SPAWNING
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SPECIES DIVERSITY
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

SPECIFIC CONDUCTIVITY
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

SPECIFICATIONS
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SPHAGNUM-RED MAPLE BOG
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SPIRODELLA
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SPIRULINA
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

SPORT FISHING
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

SPRINKLER IRRIGATION
Adjustable Height Sprinkler,
W79-01411 3F

STABILIZATION
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

STABLE ISOTOPES
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

STANDARDS
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

STANDING CROP
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

STANDING CROPS
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

STAPHYLOCOCCUS AURESUS
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

STATE JURISDICTION
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

STATISTICAL MODELS
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

STEADY-STATE MODEL
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

STEMFLOW
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

STOCHASTIC PROCESSES
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

STOCHASTIC STRUCTURE
Generation of Daily Precipitation Over an Area,
W79-01261 2B

STORAGE CAPACITY
Regional Ground-Water Management,
W79-01105 4B

STRATIFICATION
Mixing and Dispersion in Estuaries,
W79-01338 5B

STREAMFLOW
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

Runoff from Hydrologic Units in Florida,
W79-01368 7C

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

STREAMS
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

STREAMSIDE HABITATS
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

STRIP MINES
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

The Industry's Role in Energy Management,
W79-01484 6B

STRIPED BASS
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

SUBLETHAL EFFECTS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

SUBMERGED PLANTS
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

SUBSTRATES
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

SUBSURFACE DRAINAGE
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

SUBSURFACE WATERS
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

SUCCESSION
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

SUCCESSION

Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

SUDAN

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

SUGAR CORPS

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

SUGAR CROPS

Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

SULFATES

Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

SULFIDES

Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

SUNFISHES

Nitrogen Fertilization of Ponds,
W79-01439 5C

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

SURF DIATOMS

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

SURFACE FILMS

Drift Velocity of Surface Films Over Waves,
W79-01139 5B

SURFACE-GROUNDWATER RELATIONSHIPS

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

SURFACE WATERS

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

SURFACTANTS

Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

SURVEYS

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III – Wastewater Treatment,
W79-01318 5D

SURVIVAL

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SUSPENDED SEDIMENT

Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SUSPENDED SOLIDS

Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SUSPENSION CULTURE

The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

SUSQUEHANNA FLATS (MARYLAND)

Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

SUSQUEHANNA RIVER (PENN)

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SUTLEJ CATCHMENT (INDIA)

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

SWAMPS

The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

SYSTEMS ECOLOGY

Inland Wetland Definitions,
W79-01335 6E

TAMARISK

An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

TELEOST FISH

Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

TELLICO DAM (TN)

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

TEMPERATURE

The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

TENNESSEE VALLEY AUTHORITY

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

TERTIARY TREATMENT

Observations on Algal Populations and Experimental Maturation Pond System.
W79-01196 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

TETON DAM
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

TETON DAM (IDAHO)
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

TETON DAM (MONT)
Floods from Breaching of Dams,
W79-01267 8B

TEXAS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

THAILAND
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

THEORETICAL ANALYSIS
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

THERMAL ENERGY
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

THERMAL ENERGY STORAGE
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

THERMAL FOG DISPERSAL
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

THERMAL POLLUTION
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

THERMAL POWERPLANTS
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

The Expanding Geysers,
W79-01116 4B

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

THERMAL SHOCK
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

THERMAL WATER
Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

THOMAS-FIERING MODEL
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

THORNTHWAITE METHOD
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

THROUGHFALL
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

TIDAL EFFECTS
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

TIN
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

TISSUE ANALYSIS
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

TOLUENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

TOXICITY
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

TOXICITY

On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

TOXINS

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

TRACE ELEMENTS

Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

TRACE METALS

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

TRACERS

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TRANSMISSIVITY

Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

TRANSPLANTATION

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

TRANSPORTATION

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

TRICHLOROFLUOROMETHANE

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TRICKLING FILTERS

A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

TROPHIC LEVEL

Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

TROPHIC POTENTIAL

The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

TURBULENCE

Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

TURBULENT FLOW

Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

ULTRASTRUCTURE (VIRUS INFECTION)

Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

UNDERFLOW GATES

Control of Transients in Series Channel with Gates,
W79-01255 8B

UNDERGROUND STORAGE

The Legalization of Groundwater Shortage,
W79-01142 6E

UNDERGROUND WASTE DISPOSAL

Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

UNDERGROUND WATER STORAGE

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

UNIONID CLAMS

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

UNITED-KINGDOM

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

UNITED NATIONS

A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

UNSTEADY FLOW

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

UPPER HENRYS FORK BASIN (IDAHO)

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

UPPER KANAWHA RIVER (W VA)

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

UPTAKE

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

URANIUM

Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

URBAN-RELATED WATER RESOURCES RESEARCH

Water Quality: Problems and Research Needs,
W79-01348 6B

URBAN RUNOFF

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Quality: Problems and Research Needs,
W79-01348 6B

URBAN WATER QUALITY

Water Quality: Problems and Research Needs,
W79-01348 6B

URBANIZATION

Simulation of Flood Waves in Channels,
W79-01060 2E

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

USABLE STORAGE

Heat Storage Wells Conserve Fuels,
W79-01230 4B

USSR

Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

Interrelation of Forest and Bog.
W79-01297 2H

UTAH

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

VALLISNERIA

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

VAPOR COMPRESSION DISTILLATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

VEGETATION
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

VEGETATION ESTABLISHMENT
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

VERMONT
Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

VERMONT YANKEE FACILITY
Waste Heat Aquaculture,
W79-01467 5C

VERTICAL TUBE EVAPORATION (VTE)
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

VINYLIDENE CHLORIDE
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

VIRGINIA
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

VIRUS REMOVAL
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

VIRUSES
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

VITAMIN B
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

VOLCANIC SOILS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

VOLUMETRIC ANALYSIS
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

WALES
Annual Catchment Losses-A Practical Method,
W79-01248 2D

WASHINGTON
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

WASTE DILUTION
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

WASTE DISPOSA
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

WASTE DISPOSAL
The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

WASTE HEAT AQUACULTURE
Waste Heat Aquaculture,
W79-01467 5C

WASTE TREATMENT
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

WASTE WATER DISPOSAL
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

WASTE WATER (IRRIGATION)
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

WASTE WATER TREATMENT
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Proceedings of a Symposium on Land Treatment of Waste Effluents Center of Adult Education, University of Maryland, April 25-26, 1978.
W79-01329 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

Treating Paint Waste Solids,
W79-01416 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

WASTES
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

WASTEWATER TREATMENT
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Waste-Water Treatment System,
W79-01420 5D

WATER ALLOCATION (POLICY)
Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER ANALYSIS
Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

WATER BALANCE
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

WATER CHEMISTRY
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

WATER CIRCULATION
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)
Manual of Individual Water Supply Systems.
W79-01311 5F

WATER DEMAND
The Management of Groundwater Supplies,
W79-01117 4B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER DISTRIBUTION (APPLIED)
Manual of Individual Water Supply Systems.
W79-01311 5F

WATER DISTRICTS
Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

WATER HYACINTH
Fresh-Water Weeds are a Resource,
W79-01197 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

WATER LAW
Groundwater Law: More Questions Than Answers,
W79-01118 6E

Water Resources and the Land-Water Interface.
W79-01295 6E

WATER LEVEL FLUCTUATIONS
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

WATER LOSS
Annual Catchment Losses-A Practical Method,
W79-01248 2D

WATER MANAGEMEN (APPLIED)
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

WATER MANAGEMENT (APPLIED)
Regional Ground-Water Management,
W79-01105 4B

The Management of Groundwater Supplies,
W79-01117 4B

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

National Water Commission Views Groundwater Protection,
W79-01155 5G

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Principles for Water Quality Management,
W79-01165 5G

Little River, Iowa, Watershed Project.
W79-01175 6E

WATER MOVEMENT
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

WATER POLICY
Principles for Water Quality Management,
W79-01165 5G

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

State Waters-General Provisions.
W79-01183 6E

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER POLLUTION
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

Organic Compounds in the Delaware River.
W79-01252 5B

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

WATER POLLUTION CONTROL

Recovery of Nitrosamines from Water,
W79-01006 5D

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

WATER POLLUTION EFFECTS

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

Organic Contaminants,
W79-01471 5C

WATER POLLUTION SOURCES

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Organic Contaminants,
W79-01471 5C

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

WATER POLLUTION TREATMENT

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Process for the Purification of Industrial Effluents,
W79-01396 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Purifying Water,
W79-01402 5F

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Treating Paint Waste Solids,
W79-01416 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

Waste-Water Treatment System,
W79-01420 5D

WATER PURIFICATION

Removal of Metallic Impurities from Water by Electrochemical Methods.
W79-01121 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Water Sterilization Apparatus,
W79-01395 5F

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Water Purification Process,
W79-01404 5D

Purification of Water for Boiler,
W79-01405 5F

Low Turbulence Settling Tank,
W79-01409 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

WATER QUALITY

Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution.
W79-01018 5A

Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Regional Ground-Water Management,
W79-01105 4B

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Water Quality: Problems and Research Needs.
W79-01348 6B

Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin.
W79-01369 7C

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida.
W79-01376 7C

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

WATER QUALITY CONTROL

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

National Water Commission Views Groundwater Protection,
W79-01155 5G

Principles for Water Quality Management,
W79-01165 5G

Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Water Sterilization Apparatus,
W79-01395 5F

Algaecidal Composition,
W79-01401 5F

Methods and Compositions for Dispersing Oil Films.
W79-01407 5G

Method for Sequestering Metal Ions,
W79-01417 5G

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976.
W79-01473 5B

WATER QUALITY INDICES

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

WATER QUALITY STANDARDS

Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

WATER RESOURCES

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

WATER RESOURCES DEVELOPMENT

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Little River, Iowa, Watershed Project.
W79-01175 6E

State Waters-General Provisions.
W79-01183 6E

Water Resources and the Land-Water Interface,
W79-01295 6E

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER REUSE

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Wastewater Recycling on Forest Lands,
W79-01424 5D

WATER RIGHTS

Groundwater Law: More Questions Than Answers,
W79-01118 6E

The Legalization of Groundwater Shortage,
W79-01142 6E

Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

WATER SAMPLING

Recovery of Nitrosamines from Water,
W79-01006 5D

Tidal Sampler,
W79-01388 7B

WATER STORAGE

Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Using Large Diameters to Increase Well Storage,
W79-01109 8B

WATER STRESS

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

WATER SUPPLY

Citizen Participation for Successful Village Water Supply,
W79-01112 6B

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

Manual of Individual Water Supply Systems.
W79-01311 5F

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER SUPPLY DEVELOPMENT

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

WATER TABLE
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

WATER TANKS
Using Large Diameters to Increase Well Storage,
W79-01109 8B

WATER TEMPERATURE
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

Waste Heat Aquaculture,
W79-01467 5C

WATER TREATMENT
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Water Sterilization Apparatus,
W79-01395 5F

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Purification of Water for Boiler,
W79-01405 5F

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

Method for Sequestering Metal Ions,
W79-01417 5G

WATER UTILIZATION
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

WATER VALVES
A Water Well Evaluation System,
W79-01102 8B

WATER WELLS
A Water Well Evaluation System,
W79-01102 8B

Well Logs...Are They Really Necessary,
W79-01119 7C

WATER YIELD
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

WATERFOWL
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

WATERSHED BASINS
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

WATERSHED MANAGEMENT
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Little River, Iowa, Watershed Project.
W79-01175 6E

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

WATERSHEDS (BASINS)
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Annual Catchment Losses-A Practical Method,
W79-01248 2D

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

WAVES (WATER)
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

WEATHER FORECASTING
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

WEATHER MODIFICATION
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

WELL CASINGS
A Look at RPM Plastic,
W79-01114 8G

WELL DATA
Well Logs...Are They Really Necessary,
W79-01119 7C

WELL DEVELOPMENT
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

WELLS
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

Using Large Diameters to Increase Well Storage,
W79-01109 8B

Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

WEST VIRGINIA
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

WESTERN GOVERNORS POLICY OFFICE
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

WETLANDS
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

Inland Wetland Definitions,
W79-01335 6E

WHITE-FOOTED MICE
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

WHITE RIVER WATERSHED (VERMONT)
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

WHTE PERCH
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

WILDLIFE HABITATS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

WIND EROSION
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

WIND-GENERATED WAVES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

WIND VELOCITY
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

WINDS
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

WISCONSIN
Metallic Mining Reclamation Act,
W79-01188 6E

Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

WITHLACOOCHEE RIVER (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

YEASTS
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

YELLOW-TAIL
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

YELLOW WATER LILY
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

ZINC
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

ZIRCONIUM SALTS TREATMENT
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

ZOOPLANKTON
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

AUTHOR INDEX

ABBI, S. D. S.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

ABDELMESSIH, A. H.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

ADACHI, N.
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

ADELMAN, I. R.
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

ADRIANO, D. C.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

AHLERT, R. C.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

AISAKA, K.
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

AKATSUKA, H.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

AKHTAR, M. A.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

AKIM, G. L.
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

ALEXANDER, M.
Recovery of Nitrosamines from Water,
W79-01006 5D

ALTURA, D.
Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

AMEIN, M.
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

AMIARD-TRIQUET, A.
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

ANDERSON, D. B.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

ANDERSON, F. O.
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

ANDERSON, J. C.
Energy and the Colorado River,
W79-01167 3E

ANDERSON, W. L.
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

ANGELIER, N.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

AOYAMA, I.
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

APPLEMAN, R.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

ARMSTRONG, F. A. I.
Organic Contaminants,
W79-01471 5C

ARNOLD, L. E.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

ASAKURA, S.
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

ASHIROV, A.
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

AURAND, D.
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

AYUKAWA, B.
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

BAKER, B. A.
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

BAKER, M. JR.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

BALASUBRAMANIAN, V.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

BALHAR, L.
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

BALL, I. J.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

BALLOFFET, A.
Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

BANKS, H. O.
National Water Commission Views Groundwater Protection,
W79-01155 5G

BARANOWSKI, A.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

BARBER, R. T.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

BARKLEY, M. B.
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

BARNES, D. A.
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

BARRINGTON, K.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

BAY, R. W.
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

BAYLEY, S.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

BAYNE, B. L.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

BELL, G. R.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

BELL, J. N. B.
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

BEN-ASHER, J.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

BERGEN, G. S. P.
Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

BERGER, V. Y.
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

BERMAN, T.
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

BEZELLA, D. A.
Algaecidal Composition,
W79-01401 5F

BIDLEMAN, T. F.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

BIESZKIEWICZ, E.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

BINGHAM, F. T.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

BISHOP, H. K.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

BLACKARD, J.
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

BLANTON, J. O. III.
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

BLASER, R. E.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

BLODGETT, J. E.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

BLOOMER, I.
Treating Paint Waste Solids,
W79-01416 5D

BLUNDO, R.
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BOATMAN, D. J.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

BODLEY, W. E.
Control of Transients in Series Channel with Gates,
W79-01255 8B

BOLOHAN, M.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

BOND, M. T.
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

BONHAM, K.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

BORGHESE, E. M.
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

BORMAN, R. G.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

BOULDING, E.
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

BOULENGER, P.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

BOYD, C. E.
Nitrogen Fertilization of Ponds,
W79-01439 5C

BOYD, R. E.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

BRADLEY, M. D.
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

BRANDT, H. T.
Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

BRAS, R. L.
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

BRENNAN, T. P.
Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

BRICARELLO, J. R.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

BRICE, R. R.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

BROOKS, W. A.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

BROSETT, C.
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

BROWN, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

BROWN, R. J.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

BRUVOLD, W. H.
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

BRYAN, G. W.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

BUCK, J.D.
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

BURGESS, P.
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

CAMPBELL, G. S.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

CAMPBELL, I. C.
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

CAMPBELL, W. J.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

CAREY, A. E.
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

CARLILE, B. L.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

CARLSON, A. R.
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

CARLSON, K.
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

CARTER, J. G. T.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

CARVER, J. A. JR.
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

CECILIO, C. B.
Criteria for Routing the Dam-Break Flood,
W79-01278 8B

CEDERHOLM, C. J.
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

CHAMBERLAIN, A. J.
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

CHAMBERLAIN, P. G.
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

CHAMBLEE, J. A.
Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

CHAN, M. C.
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

CHANCE, D. A.
Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

CHANG, A. C.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

CHANG, P. W.
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

CHAO, B. T.
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

CHARI, K. S.
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

CHECK, L. M.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

CHEN, C-L.
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

CHEN, E. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

CHEN, R.
Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

CHENG, L.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

CHERRY, D. S.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

CHERUBINI, A.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

CHESEBROUGH, E. W.
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

CHITTENDEN, M. E. JR.
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

CHRISTENSEN, E. R.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

CLARK, C. W.
Renewable Resource Management and Extinction,
W79-01495 6A

COFFIN, J. H.
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

COLE, J. C.
Adjustable Height Sprinkler,
W79-01411 3F

COLLINS, J. W.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

COLON, R.
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

COMMON, M. S.
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

COOKE, A. S.
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

COOLEY, J. M.
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

CORTOPASSI, D. A.
Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

COSNER, O. J.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

COSTA, J. E.
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

COURT, A.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

COWARDIN, L. W.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

COX, J. A.
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

CRAWFORD, N. H.
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

CROLEY, T. E. II
Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

CSANADY, G. T.
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

DAIBER, F. C.
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

DANEKE, G. A.
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

DANIEL, T. C.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

DAVIS, G. H.
Self-Propelled Dredging Apparatus,
W79-01389 8C

DAVIS, N. W.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

DAY , J. B.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

DEACUTIS, C. F.
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

DEAN-RAYMOND, D.
Recovery of Nitrosamines from Water,
W79-01006 5D

DEANGELIS, P.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

DEJU, R. A.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

DELLEUR, J. W.
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

DEMBO, M. M.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

DENISON, E. F.
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input.
W79-01491 6B

DESTY, D. H.
Breakwater,
W79-01400 8A

DEVAUL, R. W.
Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

DICKEY, M. L.
Should the Law of the Sea Conference Be Saved,
W79-01157 6E

DIK, S. R.
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

DILLARD, J. W.
Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

DILLON, M. A.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

DINUNZIO, J. E.
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

DISALVO, L. H.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

DITTON, R. B.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

DIXON, P.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

DOBOSY, R. J.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

DODGE, W. E.
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

DOLAN, R.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

DONALDSON, L. R.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

DONIGIAN, A. S. JR.
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

DONNELLY, R. G.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

DOORIS, P. M.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

DOUGHERTY, M. T.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

DOWNES, M. T.
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

DRECHSLER, H. D.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

DRUFFEL, L. A.
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

DU FRESNE, E. R.
System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

DUBEY, G. A.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

DUCKERT, W.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

DUCKWORTH, R.
Breakwater,
W79-01400 8A

DUNN, E. L.
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

DUNSON, W.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

DYE, J. E.
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

DYSART, J. E.
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

ECKART, J. F.
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

EDWARDS, C. D.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

EFREMOV, S. P.
About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

EGANHOUSE, R. P.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

EIBL, V.
Method of Purifying Water,
W79-01402 5F

ELLIOTT, R. D.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

ELLIS, J. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

ELMENDORF, M.
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

ENGEL, R.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

ERDMANN, D. E.
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

ERICKSON, L. E.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

ESSERY, I. T. S.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

ETZEL, J. E.
Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

EWEL, K. C.
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

FALES, R. R.
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

FAN, L. T.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

FARHAR, B. C.
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

FARMER, M.
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

FAVER, D. E.
The National Energy Plan,
W79-01480 6B

FENICAL, W.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

FFOLLIOTT, P.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

FILBY, J.
Purification of Water for Boiler,
W79-01405 5F

FINSTEIN, M. S.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

FISCHER, H. B.
Mixing and Dispersion in Estuaries,
W79-01338 5B

FISCHER, W.
Water Sterilization Apparatus,
W79-01395 5F

FISHMAN, G. I.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

FLEMER, D. A.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

FLETCHER, M. R.
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

FORD, R. S.
Well Logs...Are They Really Necessary,
W79-01119 7C

FOULQUIER, L.
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

FRANCIS, A. J.
Recovery of Nitrosamines from Water,
W79-01006 5D

FRANZ, D. D.
Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

FREAD, D. L.
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

FRENCH, J. E.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

FRITZ, R. G.
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

FUKAI, T.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

FUKUI, T.
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

GAD-EL-HAK, M.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

GAINES, L.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

GALE, G. M.
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

GALLAGHER, J. L.
Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

GAMBRELL, R. P.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GAMES, L. M.
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

GANJE, T. J.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

GARDNER, D.
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

GARRETT, P.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

GARRETT, P. G.
Coordinated Energy Management,
W79-01479 6B

GARRISON, J. M.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

GASS, T. E.
The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

GAY, L. W.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

GIBBONS, J. W.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

GIBBS, P. E.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

GIBSON, R. J.
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

GILBERT, L. W.
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

GILEAD, G.
Water Conduit,
W79-01390 3F

GILLIAM, J. W.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

GILMER, D. S.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

GLAESER, J. M.
Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

GLASS, G. E.
Organic Contaminants,
W79-01471 5C

GLATER, J.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

GLEASON, V. E.
The Legalization of Groundwater Shortage,
W79-01142 6E

GODFREY, P. J.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

GOLDBERGER, W. M.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

GOLDEN, F. M.
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

GOLDEN, S. L.
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

GOLDSMITH, R. L.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

GOLDSTEIN, A. K.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

GONZALES, A.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

GOOLSBY, D. A.
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

GOTO, K.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

GOULD, D. J.
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

GRANT, D. C.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

GRAY, W. G.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

GREEN, R. E.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

GREENE, N. D.
Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

GRIFFICEN, W.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

GRIFFIN, D. B.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

GRUBB, H. F.
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GUM, R. L.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

GUPTA, P. K.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

GUSTAVSON, T. C.
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

GUTHRIE, L. G.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

GUTHRIE, R. K.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

GWIN, R. E. JR.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

HAASE, J.
Process for the Purification of Industrial Effluents,
W79-01396 5D

HAIL, P. L.
The Management of Groundwater Supplies,
W79-01117 4B

HAINES, B. L.
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

HALLENBECK, W. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

HALMOVA, T.
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

HAMILTON, D. H.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

HANCK, K. W.
Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Evaluation of Micromolar Complexiometric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

HANKS, R. J.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

HANN, R. W. JR.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

HANNAFORD, J. F.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

HARDER, S. M.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

HARDING, D. J.
Low Turbulence Settling Tank,
W79-01409 5D

HARR, C. A.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

HARSH, J. F.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

HARTER, L. G.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

HARTMANN, L.
Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

HARVEY, G. R.
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

HATTULA, M. L.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

HAUSZ, W.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

HAWKES, J. M.
Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

HAWKINS, R. H.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

HAYES, D. W.
Tidal Sampler,
W79-01388 7B

HAYES, J. M.
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

HEADY, E. O.
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

HEALY, K. A.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

HEATH, R. C.
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

HEINLE, D. R.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

HEISS, H. W.
Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

Regional Geology Series: Part X,
W79-01115 2F

Using Large Diameters to Increase Well Storage,
W79-01109 8B

HELWEG, O. J.
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Regional Ground-Water Management,
W79-01105 4B

HENNY, C. J.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

HERBACH, E. G.
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

HERMAN, L. J.
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

HERNANDEZ, J. W.
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

HERSHBERGER, W. K.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

HERSON, A.
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

HERVEY, A.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

HILLMAN, M. E. D.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

HILLMAN, R. E.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

HITES, R. A.
Organic Compounds in the Delaware River,
W79-01252 5B

HOEL, M.
Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

HOFCROFT, F. J.
Waste-Water Treatment System,
W79-01420 5D

HOLMSTROM, B. K.
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

HOLZEN, H. H.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

HOOPER, F. F.
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

HOSZOWSKI, A.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

HOUGHTON, D. D.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

HOUSTON, C. W.
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

HOWARD, A. D.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

HOWE, E. D.
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

HSU, I. C.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

HSU, P. H.
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

HUFSCHMIDT, M. M.
Water Quality: Problems and Research Needs,
W79-01348 6B

HUGHES, G. H.
Runoff from Hydrologic Units in Florida,
W79-01368 7C

HULME, P. D.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

HUNSAKER, V. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

HUNTER, J. T.
Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

HUNTINGTON, S. W.
Simulation of Flood Waves in Channels,
W79-01060 2E

HUTTULA, M. L.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

IKEDA, S.
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

IKEDA, Y.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

INOUE, Y.
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

IVASHCHENKO, E. V.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

IWATA, M.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

JACK, W. L.
Annual Catchment Losses-A Practical Method,
W79-01248 2D

JANAIUNEN, J.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

JANATUINEN, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

JANZOW, E. F.
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

JAWORSKI, N. A.
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

JENKINS, C. R.
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

JENKINS, S. R.
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

JENNE, E. A.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

JOHNSON, C. C.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

JOHNSON, J. N.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

JOHNSON, R.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

JOHNSON, W. R. III
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

JOLLEY, R. L.
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

JOWETT, P. E.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

JUSTICE, C.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

JUUL, R. B.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

KAISER, K. L. E.
Organic Contaminants,
W79-01471 5C

KALLQVIST, T.
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

KANEHIRO, Y.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

KARR, J. R.
Water Resources and the Land-Water Interface,
W79-01295 6E

KATAGIRI, A.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

KATOPODES, N.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

KAUFFMAN, K.
Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

KAWAMURA, S.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

KAWASAKI, M.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

KAZDA, J.
The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

KEEFE, C. W.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

KEEFER, T. N.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

KEITH, J. E.
Energy and the Colorado River,
W79-01167 3E

KELKAR, D.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

KELWAY, P. S.
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

KENNARD, W. C.
Inland Wetland Definitions,
W79-01335 6E

KENNEDY, J. F.
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

KENNEDY, O.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

KHALID, R. A.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

KILDOW, J. T.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

KIM, H. G.
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

KING, D.
Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

KING, G. A. M.
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

KIRBY-SMITH, W. W.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

KISSINGER, G.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

KLEI, H. E.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

KLEIN, G.
Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

KLOTZ, R. L.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

KNIGHT, A. W.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

KOBAYASHI, S.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

KOBAYASHI, Y.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

KOENINGS, J. P.
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

KOIDE, M.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

KORTMANN, R. W.
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

KOZLOVSKAYA, L. S.
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

KRAEUTER, J. N.
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

KRAMER, D.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

KREYSA, G.
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

KUBICEK, D. A.
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

KUERSTEINER, R. L.
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

KUHNS, R. E.
Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

KUNKEL, B. A.
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

KURTZ, J. E.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

KUZNETSOV, G. I.
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

LAIRD, A. D. K.
Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

LAPERRIERE, J.
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

LARSON, E.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

LASSETER, E. L. JR.
Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

LAUMYANSKAS, G. A.
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

LEE, G. F.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

LEE, M. T.
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

LEE, Y.
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

LEFOR, M. W.
Inland Wetland Definitions,
W79-01335 6E

LEIBOVITZ, J.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

LEITCH, J. A.
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

LETTERMAN, R. D.
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

LEWIN, J.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

LEWIS, J. M.
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

LIAO, P. B.
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

LIN, J. D.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

LIST, R.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

LITTLER, M.
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

LOE, B. R.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

LOVELL, A. D.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

LOWE, G. W.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

LUOMA, S. N.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

LYNCH, D. R.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

LYNN, S.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

MACMILLAN, A. L.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

MADISON, F. W.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

MAHALL, B. E.
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

MAHLER, R. J.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

MAITLEN, C. E.
Self-Propelled Dredging Apparatus,
W79-01389 8C

MAITLEN, R. E.
Self-Propelled Dredging Apparatus,
W79-01389 8C

MALL, L. P.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

MALONEY, F. E.
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

MANGES, H. L.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

MANGI, J.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

MANZI, J. J.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

MARGOLF, C.
Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

MARSHALL, K. C.
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

MARTENS, D. W.
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

MARTIN, D. F.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

MARTIN, W. E.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

MARTNER, B. E.
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

MATSON, E. A.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

MATULEWICH, V. A.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

MCBRIDE, L. J.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

MCCAFFERTY, W. P.
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

MCCARTY, P. L.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

MCCLUNG, C. R.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

MCCONNEL, O. J.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

MCCUTCHAN, J. W.
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

MCDONALD, D. B.
Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

MCGARRY, M.
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

MCNEAL, B. L.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

MCNULTY, K. J.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

MCWHORTER, J. C.
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

MEADOWS, B. S.
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

MEKELBURG, M.
Critique of the Challenges,
W79-01486 6B

MELENT'EVA, N. D.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

MELLANBY, K.
A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

MELLING, H.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

MENZEL, R. G.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

METZNER, H. E.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

MEYER, C. F.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

MICHELSEN, E. R.
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

MILLERO, F. J.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

MITCHELL, G. F.
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

MITSCH, W. J.
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

MIURA, M.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

MIZUMOTO, S.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

MOHR, M. C.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

MONTZ, G. N.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

MOORE, J. N.
In Search of Common Nodules at UNCLOS III,
W79-01163 6E

MOORE, J. S.
State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

MOORE, J. W.
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

MORAIN, E. W.
Adjustable Height Sprinkler,
W79-01411 3F

MORGAN, D.
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

MORGAN, R. P. JR.
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MORRIS, A. R.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

MORRIS, J. S.
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

MORTON, J. B.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

MUELLER, H. F.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

MULLIGAN, H. F.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

MUNRO, G. R.
Renewable Resource Management and Extinction,
W79-01495 6A

MURAMATSU, T.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

MURPHY, L. S.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

MURRAY, J. P.
Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

MUSGROVE, C. A.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

MYREEN, B.
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

NAKATO, T.
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

NAWAFUNE, H.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

NAWROCKI, M. A.
Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

NEHER, M. A.
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

NEMETZ, P. N.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

NEUFELD, M. N.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

NEUFELD, R. D.
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

NEWHOUSE, L.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

NEWLIN, J.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

NG, J.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

NICHOLS, W. L.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

NIIMI, A. J.
Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

NIKAIDO, M. M.
Recovery of Nitrosamines from Water,
W79-01006 5D

NOBE, K.
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

NORDLUND, W.
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

NOVITZKI, R. P.
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

NOWLAN, P. H.
Boring and Sampling Techniques,
W79-01103 8G

NYLUND, U.
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

NYQUIST, D.
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

ODUM, W. E.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

OGLE, J.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OI, E.
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

OKUM, D. A.
Principles for Water Quality Management,
W79-01165 5G

OTIS, J. L.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

OZAKI, H.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

P'YAVCHENKO, N. I.
Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

PAASIVIRTA, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PAGE, A. L.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

PAGE, V. W.
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

PALLOTTI, B. L.
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

PANKOW, J.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

PAREKH, B. K.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

PARK, J. S.
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

PARK, R. B.
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

PARK, Y. A.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

PARKHOMETS, A. P.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

PASSIVIRTA, J.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

PATEL-MANDLIK, K.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

PATRICK, W. H. JR.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

PATRIQUIN, D. G.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

PATTERSON, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

PATTERSON, R. E.
Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

PAUL, A. J.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

PEDRICK, R. A.
Nonmetallic Elutriation and Sieving Device for Benthic Macrofauna,
W79-01447 5G

PENNAK, R. W.
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

PERKEY, D. J.
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

PERKINS, L. Z.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

PERLAKY, C.
Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

PERRY, H. D.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

PERSSON, N. Y.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

PESCH, C. E.
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

PEVZNER, I. D.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

PHELPS, G. G.
Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

PIERCE, D. B.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

PIETERSE, A. J. H.
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

PIRIE, N. W.
Fresh-Water Weeds are a Resource,
W79-01197 5C

PIRON, D. L.
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

PITT, W. W. JR.
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

PLATONOV, G. M.
The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

PLOTKIN, M. J.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

POLAND, J. F.
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

POLLINGHER, U.
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

POLSON, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

PONCE, S. L.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

POPOVICH, L.
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

PORTER, G. H.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

POSSARDT, E. E.
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

POST, F. J.
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

POST, J.
The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

POUGH, F. H.
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

POWER, G.
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

POWERS, W. L.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

PRATT, P. F.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

PRICE, J. T.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

PRICE, M.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

PRINCE, R. D.
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

PUIU, M.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

QUENET, L.
The Expanding Geysers,
W79-01116 4B

QUINN, J. G.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

RAAB, G.
Method for Sequestering Metal Ions,
W79-01417 5G

RAMIREZ ROJAS, A. J.
Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

RAMSEIER, R. O.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RAMSEYER, J. B.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RAO, P. S. C.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

RAO, S. V. R.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

RASARATNAM, S. K.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

RAY, S. M.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

REDMOND, H. J.
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

REISCH, M. E. A.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

RHEAD, M. M.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

RICHARDSON, C.
Generation of Daily Precipitation Over an Area,
W79-01261 2B

RICHERT, K. D.
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

RIECHMANN, J. H.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

RIELEY, J. O.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

RIES, A.
Method of Purifying Water,
W79-01402 5F

RIGHTMIRE, C. T.
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

RINKLE, R.
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

RO, C. U.
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

ROBBINS, W. J.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

ROBERTS, J. F.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

ROBERTS, P. V.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

RODGERS, J. H. JR.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

ROGERS, D. C.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

ROLFE, G. L.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

ROMAN, W. M.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

ROOS, A.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

ROPER, M. M.
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

ROPER, R. E.
Evaluation of Activated Sludge Hydraulic Control Techniques through Pilot Plant Analyses,
W79-01325 5D

ROWE, K.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

RUCKER, M. L.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

RUFFER, H.
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

RUGGLES, C.
Mud and Clay,
W79-01120 8G

RUTLEDGE, A. T.
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

RYKIEL, E. J. JR.
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

SAGE, W. W.
Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

SALDICK, J.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

SALLO, F. W. JR.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

SAMMIS, T. W.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

SARKKA, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

SASTRY, K. V.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

SCHAMBER, D.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

SCHERFIG, J.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

SCHIMMEL, C.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

SCHLOSSER, I. J.
Water Resources and the Land-Water Interface,
W79-01295 6E

SCHMIDT, J. C.
Algaecidal Composition,
W79-01401 5F

SCHMIDT, K.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SCHNIDMAN, F.
Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

SCHOENBAUM, T. J.
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

SCHULTZ, D. M.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

SCHWARTZ, J.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

SCOTT, B. C.
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

SCOTT, D. F.
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

SCREPETIS, A. J.
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

SEITZ, W. D.
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SELVALINGAM, S.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

SEMMENS, M. J.
Water Purification Process,
W79-01404 5D

SENECAL, P. F.
The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

SEPHTON, H. H.
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

SEQUEIRA, R.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

SERVIZI, J. A.
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

SEYMOUR, D. E.
Algaecidal Composition,
W79-01401 5F

SEYMOUR, J. L.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

SHAFFER, R. W.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

SHAH, P. S.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

SHAPIRA, N. I.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

SHARITZ, R. R.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SHARMA, B.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

SHARMA, M. N.
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

SHARP, J. W.
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

SHARPLESS, R.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

SHAW, D. G.
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

SHELDON, L. S.
Organic Compounds in the Delaware River,
W79-01252 5B

SHEYNFELDT, G. M.
Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

SHILLINGLAW, S. N.
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

SHIREMAN, J. V.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

SICK, L. V.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

SIEGFRIED, C. A.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

SIGNOR, D. C.
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SILLIMAN, K. G.
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

SILVER, J. L. F.
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

SILVESTRI, M.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

SIMONS, R. K.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

SIMS, W. A.
The Response of Firms to Pollution Charges,
W79-01499 5G

SINGER, M. J.
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

SINGH, V. P.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

SINKOVIC, J.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

SITTENFIELD, M.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

SITTS, R. M.
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

SKAGGS, R. W.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

SLACK, L. J.
Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

SLAUGHTER, G. M.
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

SMITH, M. A.
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

SMITH, M. L.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

SMITH, P. M.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

SNUKISHKIS, Y. Y.
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

SNYDER, F. F.
Floods from Breaching of Dams,
W79-01267 8B

SOMMER, K.
Method for Sequestering Metal Ions,
W79-01417 5G

SOPPER, W. E.
Wastewater Recycling on Forest Lands,
W79-01424 5D

SOROKIN, A. I.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

SOUZA, S. J.
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

SOWLES, J. W.
Nitrogen Fertilization of Ponds,
W79-01439 5C

SPIEGLER, K. S.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

SPITZE, R. G.
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SPRING, J. D.
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

SPRINGER, P. F.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

SRIVASTAVA, K. K.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

ST, J. C.
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

STALTER, R.
Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

STAVER, A. W.
A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

STEENIS, J.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

STEIN, R.
Seabed Resources and International Law,
W79-01158 6E

STEINER, C.
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

STEWART, R. K.
Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

STIVEN, A. E.
Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

STODDART, D. R.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

STONE, L. R.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

STONER, J. D.
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

STOREY, D. J.
The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

STOTTS, V. D.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

STRACHAN, W. M. I.
Organic Contaminants,
W79-01471 5C

STRELKOFF, T.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

STURGES, D.
The Industry's Role in Energy Management,
W79-01484 6B

SU, S. T.
Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

SULLIVAN, M. J.
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

SULLIVAN, T. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

SUMMERFIELD, R. J.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

SUMMERS, W. K.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

SUNDA, W. G.
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

SUNDSTROM, D. W.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

SUZUKI, S.
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

SWANSON, G. C.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

SWARTS, F.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

SWEET, B. G.
A Water Well Evaluation System,
W79-01102 8B

TAIGANIDES, E. P.
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

TAKAHASHI, H.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

TAKESHITA, H.
Effluent Oil Collecting Vessel,
W79-01419 5G

TALLIS, J. H.
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

TAN, K. H.
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

TAN, M.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

TANEMURA, T.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

TANGARENE, D. R.
Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

TARNAY, D. S.
Simplified Routing through Reservoir,
W79-01266 4A

TATE, T. K.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

TAYLOR, H. E.
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

TAYLOR, R. W.
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

TEAL, J. M.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

TEBBUTT, T. H. Y.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

TELEKI, G. C.
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

TERRY, R. E.
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

TESTER, J. R.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

THIRUMURTHI, D.
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

THOMAS, A. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

THOMAS, W. A.
Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

THOMPSON, G. M.
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TLEIMAT, B. W.
Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

TOBIAS, R. F.
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

TOMLINSON, R. W.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

TONKYN, R. G.
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

TORRES, J. P.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

TRAINOR, F. R.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

TROTTA, L. C.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

TURCHEVICI, R.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

TURNER, P.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

TWILLEY, R. R.
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

UCHIDA, S.
Effluent Oil Collecting Vessel,
W79-01419 5G

UKHOVA, N. V.
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

VALIELA, I.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

VALLERA, R.
Critique and Challenges,
W79-01490 6B

VANT, M. R.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

VAUGHN, R. H.
Self-Propelled Dredging Apparatus,
W79-01389 8C

VERLOO, M. G.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

VERMEER, D. J.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

VERMEULEN, T.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

VITBERG, A. K.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

VORCHHEIMER, N.
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

WADE, J. C.
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

WAHBY, S. D.
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

WALKER, M.
The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

WALLINGFORD, G. W.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

WALTER, I.
Seabed Resources and International Law,
W79-01158 6E

WARD, G. K.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

WARDLE, W. J.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

WARREN, J. E.
A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

WATTERS, K. W.
Waste Heat Aquaculture,
W79-01467 5C

WAYENBERG, J.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

WEBBER, W.
Viewpoint from the Capital Market,
W79-01488 6B

WEBER, J. H.
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

WEED, S. B.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

WEGMULLER, H.
Process for the Purification of Industrial Effluents,
W79-01396 5D

WEISEL, G. F.
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

WENGERT, N.
Fragile Lands and People,
W79-01487 6B

WENNEMER, J.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

WHIPPLE, W. JR.
Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Quality: Problems and Research Needs,
W79-01348 6B

WHITE, E. B.
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

WHITE, R. K.
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

WHITEHEAD, R. L.
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

WIEKING, W.
Groundwater Law: More Questions Than Answers,
W79-01118 6E

WIKSTROM, L. L.
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

WILDEMAN, T. R.
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

WILEY, A. J.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

WILFORD, W. A.
Organic Contaminants,
W79-01471 5C

WILLIAMS, G. P.
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

WILLIAMS, J. R.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

WILLIAMS, W. G.
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

WILSON, J. R.
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

WILSON, S. A.
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

WISE, H. F.
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

WOLFF, A. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

WOLK, K. F.
Market Input/Output Studies. Task I. Vinylidene Chloride.
W79-01500 6B

WON, W. D.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

WRIGHT, D. L.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

WYLIE, E. B.
Control of Transients in Series Channel with Gates,
W79-01255 8B

YAMAZAKI, S.
Effluent Oil Collecting Vessel,
W79-01419 5G

YEAPLE, D. S.
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

YEARN, K. W.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

YEH, W. W-G.
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

YOO, K. H.
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

YOON, Y. S.
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

YOSHIDA, S.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

YOSHIMURA, S.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

YOSHIZAWA, S.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

YOUNG, D. R.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

YOUNG, R. W.
Treating Paint Waste Solids,
W79-01416 5D

ZAGURAL'SKAYA, L. M.
The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

ZAMUDA, C. D.
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

ZASLAVSKIY, S. V.
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

ZAWADZKI, I. I.
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

ORGANIZATIONAL INDEX

ABCOR, INC., WILMINGTON, MA. WALDEN RESEARCH DIV.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

ACKENHEIL AND ASSOCIATES GEO SYSTEMS, INC., PITTSBURGH, PA.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

ADELAIDE UNIV. (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Control of Transients in Series Channel with Gates,
W79-01255 8B

AEROMETRIC RESEARCH INC., GOLETA, CA.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

AGRICULTURAL RESEARCH COUNCIL, KHARTOUM (SUDAN).
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

AGRICULTURAL RESEARCH SERVICE, DURANT, OK. WATER QUALITY MANAGEMENT LAB.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

AGRICULTURAL RESEARCH SERVICE, TEMPLE, TX.
Generation of Daily Precipitation Over an Area,
W79-01261 2B

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MA.
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

AKADEMIYA NAUK SSSR, LENINGRAD. WHITE SEA BIOLOGICAL STATION.
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

AKADEMIYA NAUK SSSR, SIBIRSKOYE OTDELENIYE.
Interrelation of Forest and Bog.
W79-01297 2H

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

ALASKA UNIV., FAIRBANKS. INST. OF MARINE SCIENCE.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

ALEXANDRIA INST. OCEANOGRAPHY AND FISHERIES (EGYPT).
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION, WASHINGTON, DC.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

AMERICAN INST. OF PLANNERS, WASHINGTON, DC.
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

AMERON, INC., SOUTH GATE, CA. (ASSIGNEE).
System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

AMOCO PRODUCTION CO., TULSA, OK.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

APPLIED BIOCHEMISTS, INC., MEQUON, WI. (ASSIGNEE).
Algaecidal Composition,
W79-01401 5F

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

ARMY ENGINEER DIV. HUNTSVILLE, AL. CIVIL STRUCTURES BRANCH.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

ARMY ENGINEER DIV. NORTH PACIFIC, BONNEVILLE, OR. DIV. HYDRAULIC LAB.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.
Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. SOILS AND PAVEMENTS LAB.
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

ASIAN INST. OF TECH., BANGKOK (THAILAND). DIV. OF WATER RESOURCES ENGINEERING.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WA.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

AUBURN UNIV., AL. DEPT. OF CIVIL ENGINEERING.
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

AUBURN UNIV., AL. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Nitrogen Fertilization of Ponds,
W79-01439 5C

AUERBACH ASSOCIATES, INC., PHILADELPHIA, PA.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ZOOLOGY.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

BATTELLE COLUMBUS LAB., DUXBURY, MA.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

BATTELLE COLUMBUS LAB., OH.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

BATTELLE MEMORIAL INST., COLUMBUS, OH.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WA.
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

BENCKISER-KNAPSACK G.M.B.H., LADENBURG AM NECKAR (WEST GERMANY) (ASSIGNEE).
Method for Sequestering Metal Ions,
W79-01417 5G

BETZ LABS., INC., TREVOSE, PA. (ASSIGNEE).
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

BHABHA ATOMIC RESEARCH CENTER, BOMBAY (INDIA). DIV. OF RADIOLOGICAL PROTECTION.

BHABHA ATOMIC RESEARCH CENTER, BOMBAY (INDIA). DIV. OF RADIOLOGICAL PROTECTION.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

BRIDGESTONE TIRE CO., LTD., TOKYO (JAPAN). (ASSIGNEE).
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

BRISTOL UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Simulation of Flood Waves in Channels,
W79-01060 2E

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF MATHEMATICS.
Renewable Resource Management and Extinction,
W79-01495 6A

BRITISH COLUMBIA UNIV., VANCOUVER. FACULTY OF COMMERCE AND BUSINESS ADMINISTRATION.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

BRITISH PETROLEUM CO. LTD., SUNBURY-ON-THAMES (ENGLAND). (ASSIGNEE).
Breakwater,
W79-01400 8A

BROOKINGS INSTITUTION, WASHINGTON, DC.
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

BUREAU OF MINES, TWIN CITIES, MN. TWIN CITIES MINING RESEARCH CENTER.
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

BUREAU OF RECLAMATION, DENVER, CO. ENGINEERING AND RESEARCH CENTER.
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

BUREAU OF RECLAMATION, DENVER, CO. ENGINEERING RESEARCH CENTER.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Well Logs...Are They Really Necessary,
W79-01119 7C

CALIFORNIA UNIV., BERKELEY. DEPT. OF BOTANY.
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

CALIFORNIA UNIV., BERKELEY. DEPT. OF CHEMICAL ENGINEERING.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL ENGINEERING.
Mixing and Dispersion in Estuaries,
W79-01338 5B

CALIFORNIA UNIV., BERKELEY, SCHOOL OF PUBLIC HEALTH.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

CALIFORNIA UNIV., DAVIS DEPT. OF AGRONOMY AND RANGE SCIENCE.
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Regional Ground-Water Management,
W79-01105 4B

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND CIVIL ENGINEERING.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

CALIFORNIA UNIV., IRVINE.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

CALIFORNIA UNIV., IRVINE. DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY.
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALIFORNIA UNIV., IRVINE. SCHOOL OF ENGINEERING.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ARCHITECTURE AND URBAN PLANNING.
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH.
W79-01233 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PLANT PATHOLOGY.
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

CARRIER DRYSYS LTD., LONDON (ENGLAND). (ASSIGNEE).
Treating Paint Waste Solids,
W79-01416 5D

CEA CENTRE D'ETUDES NUCLEAIRES DE CADARACHE, SAINT-PAUL-LES-DURANCE (FRANCE). LAB. D'ETUDE DE LA POLLUTION DES EAUX.
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W79-01442 5C

CENTER FOR THE STUDY OF DEMOCRATIC INSTITUTIONS, SANTA BARBARA, CA.
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

CHARLESTON COLL., SC.; AND SOUTH CAROLINA WILDLIFE AND MARINE RESOURCES DEPT., CHARLESTON.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

CIBA-GEIGY CORP., ARDSLEY, NY. (ASSIGNEE).
Process for the Purification of Industrial Effluents,
W79-01396 5D

COLORADO SCHOOL OF MINES GOLDEN.
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF EARTH RESOURCES.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF POLITICAL SCIENCE.
Fragile Lands and People,
W79-01487 6B

COLORADO UNIV., BOULDER. DEPT. OF ENVIRONMENTAL, POPULATION, AND ORGANISMIC BIOLOGY.
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

COLORADO UNIV., BOULDER. DEPT. OF SOCIOLOGY.
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

CONCORDIA UNIV., MONTREAL (QUEBEC).
The Response of Firms to Pollution Charges,
W79-01499 5G

CONNECTICUT UNIV., STORRS.
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Inland Wetland Definitions,
W79-01335 6E

CONNETICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

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Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

CORNELL UNIV., ITHACA, NY. LAB OF SOIL MICROBIOLOGY.
Recovery of Nitrosamines from Water,
W79-01006 5D

CORVALLIS ENVIRONMENTAL RESEARCH LAB., OR.
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

D.A.V. COLL., MUZAFFARNAGAR (INDIA). DEPT. OF ZOOLOGY.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

DELAWARE UNIV., LEWES. MARINE STUDIES COMPLEX.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

DELAWARE UNIV., NEWARK. DEPT. OF BIOLOGICAL SCIENCES.
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

DENVER FEDERAL EXECUTIVE BOARD, CO.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

DENVER UNIV., CO. COLL. OF LAW.
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

DENVER UNIV., CO. DEPT. OF GEOGRAPHY.
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

DEPART OF ENERGY, WASH., DC. (ASSIGNEE).
Tidal Sampler,
W79-01388 7B

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO).
Purification of Water for Boiler,
W79-01405 5F

DEPARTMENT OF LABOR, WASHINGTON, DC. OFFICE OF THE UNDER SECRETARY.
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, LOWER HUTT (NEW ZEALAND). PHYSICS AND ENGINEERING LAB.
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, TAUPO (NEW ZEALAND). ECOLOGY DIV.
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

DREW CHEMICAL CORP., BOOTON, NJ. (ASSIGNEE).
Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF PHYSICS AND ATMOSPHERIC SCIENCES.
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

DUKE UNIV., BEAUFORT, NC. MARINE LAB.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

EAST CAROLINA UNIV., GREENVILLE. DEPT. OF BIOLOGY.
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

ENERGY INC. IDAHO FALLS, ID.
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W79-01275 8B

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, SAN FRANCISCO, CA. CONSUMER AFFAIRS. CA.
Critique and Challenges,
W79-01490 6B

ENVIRONMENTAL ASSESSMENT COUNCIL, INC., NEW BRUNSWICK, NJ.
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W79-01031 5C

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W79-01469 5C

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W79-01209 5B

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A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

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W79-01309 5G

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W79-01453 5C

ENVIRONMENTAL RESEARCH LAB.- DULUTH, MN.
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

Organic Contaminants,
W79-01471 5C

ENVIRONMENTAL RESEARCH LAB., NARRAGANSETT, RI.
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

FEDERAL ENERGY ADMINISTRATION, LAKEWOOD, CO. REGION VIII.
The National Energy Plan,
W79-01480 6B

FEDERAL ENERGY ADMINISTRATION, LAKEWOOD, CO. SOCIOECONOMIC PROGRAM AND DATA COLLECTION OFFICE.
Coordinated Energy Management,
W79-01479 6B

FEDERAL ENERGY REGULATORY COMMISSION, WASHINGTON, DC.
Simplified Routing through Reservoir,
W79-01266 4A

FEDERATION OF ROCKY MOUNTAIN STATES, DENVER, CO. WESTERN STATES ENERGY POLICY OFFICE.
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

FERTIILZER ASSOCIATION OF INDIA, TROMBAY.
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

FILTERS INTERNATIONAL, INC., CHICAGO, IL. (ASSIGNEE).
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

FISH AND WILDLIFE SERVICE, CORVALLIS, OR. PATUXENT WILDLIFE RESEARCH CENTER.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

FISH AND WILDLIFE SERVICE, PORTLAND, OR.
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

FISHERIES AND MARINE SERVICE, NANAIMO (BRITISH COLUMBIA). PACIFIC BIOLOGICAL STATION.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

FLORIDA DEPT. OF NATURAL RESOURCES, TALLAHASSEE. DIV. OF MARINE RESOURCES.
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

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W79-01030 5C

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W79-01259 5C

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W79-01193 6B

GENERAL ELECTRIC CO., SANTA BARBARA, CA.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

GEOLOGICAL SURVEY, ALBANY, NY. WATER RESOURCES DIV.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

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W79-01364 6D

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W79-01372 7C

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W79-01379 7C

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W79-01387 2F

GEOLOGICAL SURVEY, LAKEWOOD, CO. WATER RESOURCES DIV.
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W79-01374 2K

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

GEOLOGICAL SURVEY, LUBBOCK, TX. WATER RESOURCES DIV.
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GEOLOGICAL SURVEY, MADISON, WI. WATER RESOURCES DIV.
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GEOLOGICAL SURVEY, MENLO PARK, CA.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

GEOLOGICAL SURVEY, NSTL STATION, MS. GULF COAST HYDROSCIENCE CENTER.
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W79-01274 8B

GEOLOGICAL SURVEY, OKLAHOMA CITY, OK. WATER RESOURCES DIV.
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

GEOLOGICAL SURVEY, RALEIGH, NC WATER RESOURCES DIV.
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

GEOLOGICAL SURVEY, SACRAMENTO, CA. WATER RESOURCES DIV.
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W79-01365 2F

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W79-01386 2C

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W79-01368 7C

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W79-01371 7C

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W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GEORGE WASHINGTON UNIV., WASHINGTON, DC. NATIONAL LAW CENTER.
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W79-01143 6E

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W79-01061 4C

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W79-01294 2I

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W79-01211 2H

GEORGIA UNIV., SAPELO ISLAND. MARINE INST.
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W79-01288 5B

GRACE (W. R.) AND CO., DALLAS, TX. MINING DIV.
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W79-01489 6B

GROUND WATER CONSULTANTS GROUP, EDMONTON (ALBERTA).
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W79-01117 4B

HAWAII UNIV., HONOLULU.
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W79-01353 6B

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W79-01360 3F

HITTMAN ASSOCIATES, INC., COLUMBIA, MD.
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W79-01307 5G

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W79-01212 2K

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A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

HYDROCOMP, INC., PALO ALTO, CA.
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W79-01004 5B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

IDAHO UNIV., MOSCOW. DEPT. OF AGRICULTURAL ENGINEERING.
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W79-01087 4D

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W79-01359 4A

IDEMITSU KOSAN CO. LTD., TOKYO (JAPAN). (ASSIGNEE).
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W79-01403 5D

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, SPRINGFIELD. DIV. OF LAND POLLUTION CONTROL.
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W79-01156 5G

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W79-01017 5C

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W79-01434 6G

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W79-01168 6E

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W79-01351 5F

ILLINOIS UNIV. AT THE MEDICAL CENTER, CHICAGO.
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W79-01010 5A

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W79-01164 5G

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W79-01295 6E

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W79-01246 2I

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W79-01293 5C

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W79-01107 8B

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W79-01065 2J

Quantification of Recreational Use of the Coralville Reservoir,
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Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
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Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
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Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRONOMY.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

KANSAS STATE UNIV., MANHATTEN.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

KANSAS STATE UNIV., MANHATTEN. DEPT. OF CHEMICAL ENGINEERING.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

KRAMER, CHIN, AND MAYO, INC., SEATTLE, WA.
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
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Waste Heat Aquaculture,
W79-01467 5C

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Dissolved Mercury in the Lake Windermere Catchment Area,
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Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
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A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
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The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
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W79-01433 2L

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MASCHINENFABRIK HELLMUT GEIGER, KARLSRUHE (WEST GERMANY). (ASSIGNEE).
Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

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Organic Compounds in the Delaware River,
W79-01252 5B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF ECONOMICS.
Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

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Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

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Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

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Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
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The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
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W79-01015 5C

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Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

NATIONAL SECURITY COUNCIL, WASHINGTON, DC. PUBLIC ADVISORY COMMITTEE ON THE LAW OF THE SEA.
Should the Law of the Sea Conference Be Saved,
W79-01157 6E

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Using Large Diameters to Increase Well Storage,
W79-01109 8B

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W79-01133 5A

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Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

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Underground Injection Program Set Under Safe Drinking Water Act,
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Biological Control Agents of Sewage Bacteria in Marine Habitats,
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Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
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Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
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Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

NORTHUMBRIAN WATER AUTHORITY, GOSFORTH (ENGLAND).
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

NUNN, SNYDER AND ASSOCIATES, FAIRFAX, VA.
Floods from Breaching of Dams,
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Chloro-Organics in Surface Water Sources for Potable Water,
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Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
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Automated Treatment and Recycle of Swine Feedlot Wastewaters,
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Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

PACIFIC GAS AND ELECTRIC CO., SAN FRANCISCO, CA.
Criteria for Routing the Dam-Break Flood,
W79-01278 8B

PARAISTEN KALKKI OY, PARGAS (FINLAND). (ASSIGNEE).
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

PEABODY COAL CO., DENVER, CO. REGIONAL COUNSEL'S OFFICE.
The Industry's Role in Energy Management,
W79-01484 6B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Wastewater Recycling on Forest Lands,
W79-01424 5D

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

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In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
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Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
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PURDUE RESEARCH FOUNDATION, LAFAYETTE, IN. (ASSIGNEE).
Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
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PURDUE UNIV., LAFAYETTE, IN.
Evaluation of Activated Sludge Hydraulic Control Techniques through Pilot Plant Analyses,
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Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

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Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
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Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

READING UNIV. (ENGLAND). DEPT. OF AGRICULTURE; AND READING UNIV. (ENGLAND). DEPT. OF HORTICULTURE.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

REICHHOLD CHEMICALS, INC., TUSCALOOSA, AL.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

RHODE ISLAND UNIV., KINGSTON.
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
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RHODE ISLAND UNIV., KINGSTON. DEPT. OF ANIMAL PATHOLOGY.
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

ROCKEFELLER UNIV., NEW YORK.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
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ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FL.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
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ROTHAMSTEAD EXPERIMENTAL STATION, HARPENDEN, (ENGLAND).
Fresh-Water Weeds are a Resource,
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Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ENVIRONMENTAL SCIENCE.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF SOIL AND CROPS.
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ZOOLOGY.
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

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Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Quality: Problems and Research Needs,
W79-01348 6B

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The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
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Water Sterilization Apparatus,
W79-01395 5F

SACHS-SYSTEMTECHNIK G.M.B.H., SCHWEINFURT (WEST GERMANY).
Method of Purifying Water,
W79-01402 5F

SAINT JOHN'S UNIV., JAMAICA, NY. DEPT. OF BIOLOGY.
Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

SAN DIEGO GAS AND ELECTRIC CO., CA.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

SAVANNAH RIVER ECOLOGY LAB. AIKEN, SC.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SCOTTO (ANTHONY J.), SMITHTOWN, NY. (ASSIGNEE).
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

SCRIPPS INST. OF OCEANOGRAPHY, LA JOLLA, CA.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CA.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

SEOUL NATIONAL UNIV. (REPUBLIC OF KOREA). DEPT. OF OCEANOGRAPHY.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

SHIKOKU PAPER MFG. CO., LTD., (JAPAN). (ASSIGNEE).
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

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Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES GEORGES CLAUDE, PARIS (FRANCE). (ASSIGNEE).
Method of Treatment of an Oxidizable Material by a Biochemical Process.
W79-01412 5D

SOUTHAMPTON UNIV. (ENGLAND).
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, EL SEGUNDO, CALIFORNIA.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

SOUTHERN CALIFORNIA METROPOLITAN WATER DISTRICT, LOS ANGELES.
The Legalization of Groundwater Shortage,
W79-01142 6E

SOUTHERN ILLINOIS UNIV. AT CARBONDALE. DEPT. OF CHEMISTRY AND BIOCHEMISTRY.
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF CHEMISTRY AND BIOCHEMISTRY.
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

SOUTHERN PIEDMONT CONSERVATION RESEARCH CENTER, WATKINSVILLE. GA.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

SPESSARD L. HOLLAND LAW CENTER, GAINESVILLE, FL.
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

STANFORD UNIV., CA. DEPT. OF CIVIL ENGINEERING.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

SUTRON CORP., ARLINGTON, VA.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

TEMPLE, BARKER AND SLOANE INC., WELLESLEY HILLS, MA.
Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

TENNESSEE VALLEY AUTHORITY, KNOXVILLE.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF POLITICAL SCIENCE.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

TEXAS UNIV. AT AUSTIN. BUREAU OF ECONOMIC GEOLOGY.
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

TEXAS UNIV. AT AUSTIN, PORT ARANSAS. PORT ARANSAS MARINE LAB.
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

TEXAS UNIV. AT DALLAS, RICHARDSON. INST. OF ENVIRONMENTAL SCIENCES.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

THAYER SCHOOL OF ENGINEERING, HANOVER, NH.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

THE PENNSYLVANIA STATE UNIV., DEPT. OF BIOLOGY.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

TIPPETT-ABBETT-MCCARTHY-STRATTON, NEW YORK.
Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

TOKYO UNIV. OF FISHERIES (JAPAN). LAB. OF PHYSIOLOGY AND PATHOLOGY.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

TORONTO UNIV. (ONTARIO). DEPT. OF PHYSICS.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

TOYAMA UNIV. (JAPAN). FACULTY OF SCIENCE.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, LONDON (ENGLAND), (ASSIGNEE).
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

UNITED STATES STEEL CORP., PITTSBURGH, PA. (ASSIGNEE).
Methods and Compositions for Dispersing Oil Films.
W79-01407 5G

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

UTAH STATE UNIV., LOGAN. DEPT. OF BIOLOGY.
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

UTAH STATE UNIV., LOGAN. DEPT. OF ECONOMICS.
Energy and the Colorado River,
W79-01167 3E

UTAH STATE UNIV., LOGAN. DEPT. OF SOIL SCIENCE AND BIOMETEOROLOGY.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

VERMONT UNIV., BURLINGTON. DEPT. OF ECONOMICS.
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

VIKRAM UNIV., UJJAIN (INDIA). SCHOOL OF STUDIES IN BOTANY.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRONOMY.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG, DEPT. OF BIOLOGY.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DIV. OF ENVIRONMENTAL AND URBAN SYSTEMS.
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

VIRGINIA STATE WATER CONTROL BOARD, RICHMOND.
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

VIRGINIA UNIV., CHARLOTTESVILLE. SCHOOL OF LAW.
In Search of Common Nodules at UNCLOS III.
W79-01163 6E

VYSKUMNY USTAV PAPIERU A CELULOZY, BRATISLAVA (CZECHOSLOVAKIA).
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

WARSAW UNIV. (POLAND). DEPT. OF ENVIRONMENTAL MICROBIOLOGY.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRONOMY AND SOILS.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

WATER RESOURCES COUNCIL, WASHINGTON, DC. TASK FORCE ON DAM-BREAK FLOOD ROUTING.
Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

WEBBER (WALTER) AND ASSOCIATES, BOULDER, CO.
Viewpoint from the Capital Market,
W79-01488 6B

WELSH NATIONAL WATER DEVELOPMENT AUTHORITY, CARDIFF.
Annual Catchment Losses-A Practical Method,
W79-01248 2D

WEST VIRGINIA UNIV., MORGANTOWN. WATER RESEARCH INST.
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

WISCONSIN ELECTRIC POWER CO., MILWAUKEE.
Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

WISCONSIN UNIV.-MADISON.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

WISCONSIN UNIV., MADISON. DEPT. OF METEOROLOGY.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

WMI, INC., OKLAHOMA CITY, OK. (ASSIGNEE).
Self-Propelled Dredging Apparatus,
W79-01389 8C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA.
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND).
Intercomparison of Conceptual Models Used in Operational Hydrological Forecasting.
W79-01062 2A

YESHIVA UNIV., NEW YORK. SCHOOL OF LAW.
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

YUMA SOIL CONSERVATION DISTRICT, AZ.
Critique of the Challenges,
W79-01486 6B

ACCESSION NUMBER INDEX

W79-01001 5G
W79-01002 6A
W79-01003 5D
W79-01004 5B
W79-01005 5C
W79-01006 5D
W79-01007 5B
W79-01008 5B
W79-01009 6E
W79-01010 5A
W79-01011 2K
W79-01012 5C
W79-01013 5C
W79-01014 5B
W79-01015 5C
W79-01016 5C
W79-01017 5C
W79-01018 5A
W79-01019 5C
W79-01020 5C
W79-01021 5C
W79-01022 5B
W79-01023 5B
W79-01024 5C
W79-01025 5C
W79-01026 5C
W79-01027 5C
W79-01028 5C
W79-01029 5C
W79-01030 5C
W79-01031 5C
W79-01032 5C
W79-01033 5C
W79-01034 2C
W79-01035 3B
W79-01036 2B
W79-01037 7B
W79-01038 5B
W79-01039 2K
W79-01040 5B
W79-01041 5B
W79-01042 5A
W79-01043 2J
W79-01044 2J
W79-01045 2L
W79-01046 5B
W79-01047 2E
W79-01048 8G
W79-01049 8D
W79-01050 8D
W79-01051 8D
W79-01052 8I
W79-01053 8B
W79-01054 8D
W79-01055 2L
W79-01056 2B
W79-01057 8G
W79-01058 3B
W79-01059 4D
W79-01060 2E
W79-01061 4C
W79-01062 2A
W79-01063 3B
W79-01064 2K
W79-01065 2J
W79-01066 5D
W79-01067 5D
W79-01068 5D
W79-01069 5D
W79-01070 5A
W79-01071 5D
W79-01072 5D
W79-01073 5E
W79-01074 5A
W79-01075 5D
W79-01076 5D
W79-01077 5D
W79-01078 5D
W79-01079 5D
W79-01080 5D
W79-01081 5D
W79-01082 5E
W79-01083 5D
W79-01084 5D
W79-01085 5B
W79-01086 5C
W79-01087 4D
W79-01088 5D
W79-01089 5C
W79-01090 5B
W79-01091 2J
W79-01092 2I
W79-01093 5D
W79-01094 3F
W79-01095 5D
W79-01096 5C
W79-01097 2I
W79-01098 5C
W79-01099 2I
W79-01100 5B
W79-01101 7B
W79-01102 8B
W79-01103 8G
W79-01104 8G
W79-01105 4B
W79-01106 3C
W79-01107 8B
W79-01108 5D
W79-01109 8B
W79-01110 8B
W79-01111 2F
W79-01112 6B
W79-01113 5B
W79-01114 8G
W79-01115 2F
W79-01116 4B
W79-01117 4B
W79-01118 6E
W79-01119 7C
W79-01120 8G
W79-01121 5D
W79-01122 6B
W79-01123 5D
W79-01124 5D
W79-01125 2I
W79-01126 3A
W79-01127 5E
W79-01128 3A
W79-01129 3A
W79-01130 4D
W79-01131 4D
W79-01132 5B
W79-01133 5A
W79-01134 5B
W79-01135 5C
W79-01136 3C
W79-01137 5G
W79-01138 6B
W79-01139 5B
W79-01140 6E
W79-01141 6E
W79-01142 6E
W79-01143 6E
W79-01144 5G
W79-01145 6E
W79-01146 5G
W79-01147 6F
W79-01148 6F
W79-01149 6E
W79-01150 5G
W79-01151 5G
W79-01152 5G
W79-01153 6B
W79-01154 5G
W79-01155 5G
W79-01156 5G
W79-01157 6E
W79-01158 6E
W79-01159 5G
W79-01160 5G
W79-01161 5G
W79-01162 5G
W79-01163 6E
W79-01164 5G
W79-01165 5G
W79-01166 5G
W79-01167 3E
W79-01168 6E
W79-01169 6E
W79-01170 6E
W79-01171 6E
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W79-01189 6E
W79-01190 6E
W79-01191 6E
W79-01192 6E
W79-01193 6B
W79-01194 5G
W79-01195 5C
W79-01196 5D
W79-01197 5C
W79-01198 5C
W79-01199 5C
W79-01200 5C
W79-01201 5C
W79-01202 5C
W79-01203 5C
W79-01204 5C
W79-01205 5G
W79-01206 5D
W79-01207 5B
W79-01208 5B
W79-01209 5B
W79-01210 5G
W79-01211 2H
W79-01212 2K
W79-01213 2H
W79-01214 5C
W79-01215 2K
W79-01216 2H
W79-01217 2L
W79-01218 2L
W79-01219 5C
W79-01220 6G
W79-01221 5C
W79-01222 5C
W79-01223 5C
W79-01224 5C
W79-01225 2L
W79-01226 2L
W79-01227 6E
W79-01228 4B
W79-01229 6G
W79-01230 4B
W79-01231 3B
W79-01232 8G
W79-01233 8G
W79-01234 8G
W79-01235 8G
W79-01236 5C
W79-01237 5C
W79-01238 3A
W79-01239 3A
W79-01240 6B
W79-01241 5C
W79-01242 6G
W79-01243 5G
W79-01244 2B
W79-01245 5B
W79-01246 2I
W79-01247 2B
W79-01248 2D
W79-01249 5G
W79-01250 5B
W79-01251 5A
W79-01252 5B
W79-01253 5B
W79-01254 5B
W79-01255 8B
W79-01256 2L
W79-01257 4A
W79-01258 5B
W79-01259 5C
W79-01260 4C
W79-01261 2B
W79-01262 8B
W79-01263 8B
W79-01264 8B
W79-01265 8B
W79-01266 4A
W79-01267 8B
W79-01268 8B
W79-01269 8B
W79-01270 8B
W79-01271 8B
W79-01272 8B
W79-01273 8B
W79-01274 8B
W79-01275 8B
W79-01276 8B
W79-01277 8B
W79-01278 8B
W79-01279 4B
W79-01280 3A
W79-01281 8G
W79-01282 5C
W79-01283 2L
W79-01284 5C
W79-01285 5C
W79-01286 5C
W79-01287 2I
W79-01288 5B
W79-01289 2L
W79-01290 5C
W79-01291 5B
W79-01292 4C
W79-01293 5C
W79-01294 2I
W79-01295 6E
W79-01296 5C
W79-01297 2H
W79-01298 2H
W79-01299 2H
W79-01300 2H
W79-01301 2G
W79-01302 2G
W79-01303 2G
W79-01304 2H
W79-01305 2H
W79-01306 2L
W79-01307 5G
W79-01308 5G
W79-01309 5G
W79-01310 5D
W79-01311 5F
W79-01312 5F
W79-01313 5F
W79-01314 5D
W79-01315 5D
W79-01316 5D
W79-01317 5D
W79-01318 5D
W79-01319 5D
W79-01320 5D
W79-01321 5D
W79-01322 5C
W79-01323 5G
W79-01324 5D
W79-01325 5D
W79-01326 5C
W79-01327 5A
W79-01328 5E
W79-01329 5D
W79-01330 5C
W79-01331 5C
W79-01332 5C

W79-01333	5A
W79-01334	5C
W79-01335	6E
W79-01336	4A
W79-01337	5C
W79-01338	5B
W79-01339	3A
W79-01340	3A
W79-01341	2F
W79-01342	3A
W79-01343	3A
W79-01344	5A
W79-01345	5A
W79-01346	5C
W79-01347	5C
W79-01348	6B
W79-01349	5D
W79-01350	5C
W79-01351	5F
W79-01352	5D
W79-01353	6B
W79-01354	5G
W79-01355	4D
W79-01356	5B
W79-01357	2B
W79-01358	5D
W79-01359	4A
W79-01360	3F
W79-01361	6B
W79-01362	5C
W79-01363	5A
W79-01364	6D
W79-01365	2F
W79-01366	2E
W79-01367	7C
W79-01368	7C
W79-01369	7C
W79-01370	7C
W79-01371	7C
W79-01372	7C
W79-01373	7C
W79-01374	2K
W79-01375	7C
W79-01376	7C
W79-01377	2F
W79-01378	8C
W79-01379	7C
W79-01380	4A
W79-01381	5G
W79-01382	7C
W79-01383	7C
W79-01384	2F
W79-01385	4A
W79-01386	2C
W79-01387	2F
W79-01388	7B
W79-01389	8C
W79-01390	3F
W79-01391	5D
W79-01392	5D
W79-01393	5F
W79-01394	5G
W79-01395	5F
W79-01396	5D
W79-01397	5D
W79-01398	5E
W79-01399	5D
W79-01400	8A
W79-01401	5F
W79-01402	5F
W79-01403	5D
W79-01404	5D
W79-01405	5F
W79-01406	5D
W79-01407	5G
W79-01408	5D
W79-01409	5D
W79-01410	3F
W79-01411	3F
W79-01412	5D
W79-01413	5D
W79-01414	5F
W79-01415	5D
W79-01416	5D
W79-01417	5G
W79-01418	5D
W79-01419	5G
W79-01420	5D
W79-01421	5B
W79-01422	2F
W79-01423	2H
W79-01424	5D
W79-01425	3F
W79-01426	4D
W79-01427	2H
W79-01428	5D
W79-01429	3A
W79-01430	6B
W79-01431	6G
W79-01432	6G
W79-01433	2L
W79-01434	6G
W79-01435	5C
W79-01436	5C
W79-01437	5C
W79-01438	5C
W79-01439	5C
W79-01440	5C
W79-01441	5C
W79-01442	5C
W79-01443	5C
W79-01444	5B
W79-01445	5C
W79-01446	5C
W79-01447	5G
W79-01448	5C
W79-01449	5C
W79-01450	5C
W79-01451	5C
W79-01452	5C
W79-01453	5C
W79-01454	5C
W79-01455	5C
W79-01456	5C
W79-01457	5C
W79-01458	5C
W79-01459	5C
W79-01460	5A
W79-01461	5B
W79-01462	5C
W79-01463	5G
W79-01464	5D
W79-01465	5C
W79-01466	4C
W79-01467	5C
W79-01468	5B
W79-01469	5C
W79-01470	4A
W79-01471	5C
W79-01472	5B
W79-01473	5B
W79-01474	5A
W79-01475	5C
W79-01476	5A
W79-01477	5C
W79-01478	6B
W79-01479	6B
W79-01480	6B
W79-01481	6B
W79-01482	6B
W79-01483	6B
W79-01484	6B
W79-01485	6B
W79-01486	6B
W79-01487	6B
W79-01488	6B
W79-01489	6B
W79-01490	6B
W79-01491	6B
W79-01492	6A
W79-01493	6A
W79-01494	6A
W79-01495	6A
W79-01496	5G
W79-01497	5G
W79-01498	5G
W79-01499	5G
W79-01500	6B

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-01001, 01004	2
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-01066--01085	20
Illinois State Water Survey, Hydrology	W79-01034--01065 01243--01258 01260--01278	67
National Water Well Association, Water Well Construction Technology	W79-01101--01120	20
University of Florida, Eastern U. S. Water Law	W79-01140--01192	53
University of Wisconsin, Eutrophication	W79-01195--01205 01470--01477	19
University of Wisconsin, Water Resources Economics	W79-01193--01194 01478--01500	25
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-01002--01003 01005--01011 01086--01100 01121--01139 01232--01242 01279--01282 01325--01331 01334--01352 01362--01363 01421--01429	95
C. OTHER		
BioSciences Information Service	W79-01221, 01225 01259 01285--01286	13

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service (Continued)	W79-01290, 01293 01322 01332--01333 01354, 01360 01447	
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-01012--01033 01430--01446 01448--01469	61
Information Planning Associates, Inc.	W79-01206--01210 01307--01321 01323--01324 01353 01355--01359 01361	29
Ocean Engineering Information Service (Patents)	W79-01388--01420	33
Office of Water Research and Technology	W79-01227--01231	5
U. S. Geological Survey	W79-01364--01387	24
University of Massachusetts (Wetlands)	W79-01211--01220 01222--01224 01226 01283--01284 01287--01289 01291--01292 01294--01306	34

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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A05	6 00	E05	9 00	T05	300 00
A06	6 50	E06	10 50	T06	350 00
A07	7 25	E07	12 50	T07	400 00
A08	8 00	E08	15 00	T08	450 00
A09	9 00	E09	17 50	T09	500 00
A10	9 25	E10	20 00	T10	550 00
A11	9 50	E11	22 50	T11	600 00
A12	10 75	E12	25 00	T12	650 00
A13	11 00	E13	28 00	T13	675 00
A14	11 75	E14	31 00	T14	750 00
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A17	13 00	E17	40 00	T17	900 00
A18	13 25	E18	45 00	T18	950 00
A19	14 00	E19	50 00	T19	1 000 00
A20	14 50	E20	60 00	T99	*
A21	15 00	E99	*		
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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 4
FEBRUARY 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 4
FEBRUARY 15, 1979

W79-01501 -- W79-02000

cretary of the U.S. Department of the Interior has de-
ed that the publication of the periodical is necessary in the
tion of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication nats. The contents of these documents cover the water-ted aspects of the life, physical, and social sciences as l as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set lescriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-rch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

SIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries ther sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, ineers, and managers as one of several planned services ne Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the rior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-nating and supplementing the existing scientific and tech-l information activities associated with active research investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

. NATURE OF WATER

A. Properties

OLAR PHOTOLYSIS OF WATER,
or primary bibliographic entry see Field 2K.
/79-01883

. WATER CYCLE

A. General

NITED STATES PARTICIPATION IN THE NTERNATIONAL HYDROLOGICAL PRO-RAM 1975-.
'ational Committee for the International Hydrolo-cal Decade, Washington, DC.
vailable from the National Technical Information ervice, Springfield, VA 22161 as PB-253 153, rice codes: A02 in paper copy, A01 in microfiche. Report of the Panel on Post-Decade Procedures the United States National Committee for the nternational Hydrological Decade, National cademy of Sciences, Washington, D.C., 1974. 23 1 fig. NSF C-310.

escriptors: *International Hydrological Decade, Jnited States, *Programs, *Planning, Coordina-on, Administration, Research and development, nformation exchange, Water resources, Hydrol-gy, Institutions, Administrative agencies, *Inter-ational Hydrological Program.

he Panel concluded that the International Hydro-gical Program (IHP) of UNESCO merits the pport of the United States and suggested a mech-ism which it believes will be useful in imple-enting that program. The Panel believes that its commendations meet the objectives of its terms f reference, which call for a mechanism able to valuate the scientific merit of international water-elated projects and the establishment of a lead-gency relationship between the IHP of UNESCO, e Department of State, and an appropriate feder- agency. As the International Hydrological ecade experience demonstrated, any mechanism ill work only as well as its activities are support-l by related operations in the Department of tate. To this end, the Panel supplements its basic rms of reference by recommending (1) improve-ent in the coordination of water-related pro-rams under the Department of State's supervision nd (2) augmentation of the science (particularly ater-related science) capabilities of its staff as-gned to relevant UN agencies. The implementa-on of these recommendations, the Panel believes, ill constitute a major step forward in support of .S. policy, and will be of consequent benefit to e United States and the advancement of science. Humphreys-ISWS)
/79-01509

HREE-DIMENSIONAL FLOW SIMULATION N ESTUARIES,
and Corp., Santa Monica, CA.
or primary bibliographic entry see Field 2L.
/79-01524

ALSTON CREEK HOURLY PRECIPITATION IODEL,
owa Univ., Iowa City. Inst. of Hydraulic Re-earch.
or primary bibliographic entry see Field 2B.
/79-01727

IYDROLOGIC INTERPRETATION OF BASIN IORPHOLOGY,
laska Univ., Fairbanks. Inst. of Water Resources. D. Fox.
vailable from the National Technical Information ervice, Springfield, VA 22161 as PB-289 368, rice codes: A02 in paper copy, A01 in microfiche. eport IWR-95, August 1978. 14 p, 36 ref. OWRT -049-ALAS(1), 14-31-0001-5002.

Descriptors: *Alaska, *Hydrologic models, *Geomorphology, *Subarctic, *Arctic, Basins, Model studies, *Basin morphology, Small watersheds, *Slopes, *Channel network analysis, Streamflow.

Methods of quantitative geomorphology were reviewed with emphasis on hillslope profile and channel network analyses. Parameters useful in relating basin form to hydrologic processes were identified and incorporated into an hydrologic model of small, upland watersheds. Sensitivity of streamflow to these parameters was investigated and recommendations for coupling form and function in watershed model design were made.
W79-01899

THE CONTRIBUTION OF MERCURY AND CHLORINATED ORGANICS FROM URBAN RUNOFF,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
For primary bibliographic entry see Field 5B.
W79-01918

IMPACT OF URBANIZATION ON THE HYDROLOGY OF WAIRAU CREEK, NORTH SHORE, AUCKLAND,
Auckland Univ. (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01922

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
D. E. Fields, and R. J. Raridon.
In: Hydrologic Problems in Karst Regions; Proceedings of Sumposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 140-150, 1977. 14 fig, 17 ref. RANN NSF AG-389.

Descriptors: *Hydrologic cycle, *Model studies, *Water pollution, *Watersheds(Basins), *Tennessee, Water pollution sources, Routing, Hydrologic systems, Hydrographs, Computer models, Hydrologic aspects, Water quality, Erosion, Sediment transport, Fallout, Surface runoff, Analysis, Analytical techniques, Air pollution, Unified transport model.

A Unified Transport Model (UTM) which simulates hydrologic and trace element transport through the atmospheric, land, and channel ecosystems on a watershed scale was implemented and applied to Walker Branch Watershed, Oak Ridge, Tennessee. Contaminant inputs to the land surface are wetfall and dryfall as simulated by the atmospheric transport submodel, which is based on a Gaussian plume formulation. The UTM, portions of which are derived from the Stanford Watershed Model, is a mechanistic approach and incorporates algorithms detailing chemical exchange between the sediment and water phases at the land surface and in the channel system itself. Sediment transport in the channel is simulated via the CHNSED submodel where sediment dynamics are governed by bedload and suspended load transport, with each of these components partitioned into as many as twelve size classes. (See also W79-01932) (Humphreys-ISWS)
W79-01946

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
R. J. Raridon, and D. E. Fields.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 151-161, 1977, 4 fig, 3 tab, 7 ref, 1 append. RANN NSF AG-389.

Descriptors: *Hydrologic cycle, *Model studies, *Watersheds(Basins), *Tennessee, *Hydrograph analysis, Discharge(Water), Simulation analysis, Hydrologic aspects, Water quality, Surface runoff, Analysis, Analytical techniques, Computer models, Hydrographs, Potassium, Cadmium, Calibrations, *Walker Branch Watershed(Tenn), Unified transport model, Model validation.

A portion of the Unified Transport Model was validated through simulation of water, potassium, and cadmium transport on Walker Branch Watershed, Oak Ridge, Tennessee. The catchment terrain of the heavily forested 98 hectare watershed is dolomitic, while the soils are predominantly of the Fullerton or Bodine series. Measurements of wetfall and dryfall, together with hourly rainfall and daily meteorological data, provided the input for the computer program. The calculated outflows from the watershed agreed closely with the measured data. There is a net loss of potassium from the watershed while cadmium appears to be building up. (See also W79-01932) (Humphreys-ISWS)
W79-01947

THE HYDROLOGY OF KARST URBAN AREAS,
Tennessee Valley Authority, Knoxville.
R. P. Betson.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 162-175. 1977. 3 fig, 5 tab, 16 ref.

Descriptors: *Karst hydrology, *Cities, *Model studies, *Small watersheds, Hydrologic aspects, Hydrograph analysis, Water quality, Hydrographs, Karst, Hydrology, Storm runoff, Land use, Suburban areas, Watersheds(Basins), Discharge(Water), Base flow, Flood frequency.

A systematic study of the hydrology of 4 small watersheds was undertaken in Knoxville, Tennessee. Three of the watersheds were over soluble carbonate rock. Models were used to simulate equivalent rural-area hydrologic response and to help in quantifying the hydrology. It was found that urbanization can increase markedly the yield of runoff, when under rural conditions much of the potential runoff is lost to a soluble rock system. When these large increases to runoff yield are realized, the magnitude of flooding is also increased much more than would occur on other areas. On the other hand, the water quality from these urban watersheds was not found to be particularly impacted as compared with rural areas. There were some problems associated with erosion that were identified. It also was found that the atmosphere can be a major source of constituents, and karst area watersheds that lose much of their potential runoff into the carbonate rock system may be serving as filters. (See also W79-01932) (Humphreys-ISWS)
W79-01948

2B. Precipitation

ANALYSIS OF SEASONAL PERSISTENCE OF CLIMATE IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Geography.
M. P. Lawson, A. V. Douglas, and P. J. Englehart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 226, Price codes: A08 in paper copy, A01 in microfiche. Occasional Papers No 4, Project Completion Report, October, 1978. 143 p, 41 fig, 6 tab, 31 ref. OWRT A-049-NEB(1). 14-34-0001-8029.

Descriptors: *Climates, *Forecasting, *Seasonal persistence, Climatology, *Model studies, Synoptic studies, *Nebraska.

The purpose was to develop statistical and synoptic probabilistic models for forecasting seasonal climate in Nebraska by evaluating the application of climatological contingencies, statistical regression analysis and the interpretation of teleconnections between tropospheric pressure patterns and associated departures from normal weather conditions. The intra-seasonal relationship between temperature and precipitation in the state tends to be inverse in all seasons (hot-dry, cold-wet). Once a seasonal anomaly develops, persistance can be expected. Anomalously warm temperatures in summer and fall generally persist into the subsequent season. Below normal temperatures during the spring and fall have a high probability of continuing into the following season. Apparently there is a weak tendency for reversal of temperatures or a return to normal temperatures in springs which have been preceded by cold winters. Anomalies of precipitation are less predictable. Examination of midtropospheric flow patterns indicates cold, wet periods are frequently associated with major trough development in the western plains. Warm, dry seasons are associated with persistent positive height anomalies in the southern and central plains. Seasonal forecasts derived from persistence models alone were within plus or minus one class value 92 percent of the time for temperature contingencies and 78 percent for precipitation predictions.
W79-01538

SOLAR RADIATION AND URBAN HEAT ISLANDS,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung, and S. S-F. Louie.
Annals of the Association of American Geographers, Vol. 63, No. 2, June 1973, p 181-207. 23 fig, 1 tab. (Univ. of California Water Resources Center Project W-237). OWRT B-121-CAL(4).

Descriptors: *Climatology, *Solar radiation, Building climatology, Urban climatology, Urban heat islands, Cities.

A model which attempts to simulate urban absorption of solar radiation is concerned with direct solar radiation, diffuse sky radiation, diffuse radiation reflected by buildings and streets, and the shortwave energy absorbed by typical urban structures. The ratio between solar radiation absorbed by three-dimensional building-street systems and two-dimensional horizontal surfaces under cloudless conditions indicates that cities undergo great variations with latitude and season. High structure systems absorb more than six times the radiation of nonurban plains. Shading effects can create absorptance less than that of a level surface. Observations at street level may lead to erroneous conclusions concerning the energy input for the total urban interface. The examination of a circular synthetic city with varying latitudinal radiation responses indicates that daytime urban heat islands are migratory phenomena and probably influence convective air circulation in the city, that downtown areas often absorb less energy than the periphery of the inner zone, and that the mere existence of a city is sufficient to generate heat islands. (Snyder-Calif, Davis)
W79-01568

RALSTON CREEK HOURLY PRECIPITATION MODEL,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, R. N. Eli, II, and J. D. Cryer.
Water Resources Research, Vol. 14, No. 3, p 485-490, June 1978. 3 fig, 2 tab, 19 ref. OWRT A-053-IA(6) and B-055-IA(3).

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Model studies, *Mathematical models, Stochastic processes, Climatic data, Storms, Rainfall intensity, Depth-area-duration analysis, Statistical models, Data processing, Watersheds(Basins), Meteorology, Climatology, *Precipitation models.

A stochastic hourly precipitation model was developed by using the Iowa City-Ralston Creek hourly precipitation record of 33 years length. Six divisions of the year were used to account for seasonal nonstationarity. Related wet time intervals, corresponding to storm events, were scheduled by an exponentially distributed interarrival time model. Intrastorm structure was described in terms of 'storm segments,' corresponding to the passage of a storm rainfall cell or a group of cells. It was found that the location in time and the duration of storm segments can be modeled adequately by independent random variables, thus avoiding traditional computation difficulties in modeling the persistence effects encountered in hourly data. Obseved 'persistence' was preserved, since persistence results from the clustering of wet hours and the clustering of dry hours. The intensity and distribution of precipitation within storm segments were modeled by fitted log normal intensity probability distributions and by cataloging sample storm segment shapes. Generated data analysis indicated that very precise precipitation modeling and extremely high speed data generation result. (Sims-ISWS)
W79-01727

2C. Snow, Ice, and Frost

VARIATIONS IN THE DURATION OF STABLE SNOW COVER IN THE USSR,
I. D. Kopanev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 270-275, 1976. 3 fig, 1 tab, 10 ref. Translated from Transactions of the Main Geophysical Observatory (Trudy GGO), No. 349, p 14-26, 1976.

Descriptors: *Snow cover, *Spatial distribution, *Data collections, Statistical methods, Data processing, Maps, Statistics, Time, Variability, Foreign countries, Foreign research, Snow, *USSR.

Investigated were the spatial characteristics of variations in snow cover duration on the basis of long-period mean data and published sources. Information on the formation and destruction of stable snow cover was found in the voluminous tables of the Climatic Handbook of the USSR. Three maps were presented which give an indication of the distribution in days of: (1) snow cover duration; (2) the difference in the dates of appearance and formation of a stable snow cover; and (3) the difference in the dates of the destruction and disappearance of a stable snow cover. Data showed that a snow cover forms in the European USSR mainly at the end of October in the north and in mid-December in the south. The average snow cover duration decreases from north to south from 200-220 days (Khibiny, Khaseda-Khard) to 60-120 days (southern Ukraine and Northern Caucasus). Standard statistical parameters of the variability of snow cover duration were tabulated for each of 26 Hydrometeorological Service Administrations. (Humphreys-ISWS)
W79-01506

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

SNOWPACK GROUND TRUTH: RADAR TEST SITE, STEAMBOAT SPRINGS, COLORADO, APRIL 8-16, 1976,
Bittinger (M. W.) and Associates, Inc., Fort Collins, CO.
S. Howell, E. B. Jones, and C. F. Leaf.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-28633, Price codes: A03 in paper copy, A01 in microfiche. NASA Contract Report 144773, April 1976. 28 p, 6 fig, 20 tab, 2 ref. NASA NAS 5-22312.

Descriptors: *Snowpacks, *Snow surveys, *Colorado, *Remote sensing, Snow, Moisture content, Temperature, Soil moisture, Sampling, Surveys, On-site investigations, *Ground truth.

This report contained the ground-truth data taken at Steamboat Springs, Colorado, during the period April 8 - 16, 1976. The location of the Steamboat Springs site used in this mission was shown in a general location map and in detail. This area is located in the Yampa River Valley approximately 7 mi (11 km) south of the town of Steamboat Springs, Colorado. Data taken during this period included the following: (1) snow depths and densities at selected locations (using a Mount Rose snow tube), (2) snow pits for temperature, density, and liquid water determinations using the freezing calorimetry technique and vertical layer classification, (3) snow walls were constructed of various cross sections and were documented with respect to sizes and snow characteristics, (4) soil moisture at selected locations, and (5) appropriate air temperature and weather data. (Sims-ISWS)
W79-01527

AN ANALYSIS OF SENSIBLE AND LATENT HEAT FLOW IN A PARTIALLY FROZEN UNSATURATED SOIL,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 2G.
W79-01711

2D. Evaporation and Transpiration

APPLICATION OF REMOTE SENSING IN ESTIMATING EVAPOTRANSPIRATION IN THE PLATTE RIVER BASIN,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 7B.
W79-01521

REDUCING PHREATOPHYTE TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3B.
W79-01562

A NONDESTRUCTIVE APPROACH TO REDUCING RIPARIAN TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3B.
W79-01586

LINEARIZED MOISTURE FLOW WITH LOSS AT THE SOIL SURFACE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W79-01704

ANALYSIS OF FALLOW-FARMING SYSTEMS IN SEMI-ARID AFRICA USING A MODEL TO SIMULATE THE HYDROLOGIC BUDGET,
California Univ., Riverside. Dept. of Plant Sciences.
A. E. Hall, and C. Dancette.
Agronomy Journal, Vol. 70, No. 5, p 816-823, September-October, 1978. 10 fig, 4 tab, 16 ref.

Descriptors: Semiarid climates, Fallowing, Model studies, Simulation analysis, Hydrologic budget, Evaporation, Water conservation, *Soil moisture, Root system, Absorption, *Africa, *Soil evaporation.

A model was developed to predict bare soil evaporation, crop water use, and the distribution of water in the soil. Comparisons with hydrologic budget data obtained in the field with bare soil, cowpeas (Vigna unguiculata (L.) Walp.), and millet (Pennisetum typhoides (Burm. f.)S. and W.) indicated that the models performed adequately for the conditions and objectives of the study. Simulations of annual fallow, predicted that the amounts of water conserved in the soil would rapidly decrease with decreases in annual rainfall. The simulations predicted that substantial quantities of water may be conserved in the soil by partial fallow during wetter years. More soil moisture

ould be conserved in the soil by partial fallow uring wetter years. More soil moisture would be onserved with the shorter cycle variety, but the onger cycle variety would have greater need for is moisture in this climatic zone during dry years, dicating a possible advantage of rotations involv- g short cycle, and long cycle crops. The simula- ons predicted that present varieties may only use small proportion of the moisture that may be ored below 150 cm depth in the soil by partial llow, indicating a possible need for developing arieties with faster growing, deeper, root systems. Skogerboe-Colorado State)
V79-01785

OMPUTING EVAPORATION FOR INLAND VATER BODIES UNDER A VARIETY OF ETCH AND ATMOSPHERIC STABILITY ONDITIONS,
ennsylvania State Univ., University Park. Inst. or Research on Land and Water Resources.
. L. Taylor, and D. R. DeWalle.
vailable from the National Technical Information ervice, Springfield, VA 22161 as PB-289 372, rice codes: A05 in paper copy, A01 in microfiche. esearch Project Technical Completion Report. lovember 1978. 72 p, 4 fig, 9 tab, 17 ref, 5 append. OWRT B-094-PA(1), 14-34-0001-7128.

escriptors: *Evaporation lakes, Oklahoma, exas, Australia, Pennsylvania, Susquehanna iver(Penn), *Equations(Evaporation), *Cooling ater, *Thermal pollution, Ponds, *Thermal load- g, *Atmospheric stability, *Fetch length, *Free onvection, *Forced convection, Cooling pond.

n equation is developed to predict evaporation om inland water bodies which accounts for the ffects of atmospheric stability and fetch length. he equation contains a term representing free onvection, forced convection and the interaction f forced and free convection. The equation con- ins a term representing free convection, forced onvection and the interaction of forced and free onvection. The equation was tested against the yan and Harleman evaporation equation which oes not include an explicit fetch term but which oes account for free convection. Data sets from ke and cooling pond evaporation studies, e.g. ake Hefner (Oklahoma), Smithers Lake (Texas), nd Hazelwood (Australia) cooling ponds, were sed to derive empirical coefficients and initially est the equation. The equations were also com- ared using data from a thermally-loaded reach of he West Branch Susquehanna River in Pennsylva- ia. Although evaporation predictions using both he Ryan and Harleman equation and the proposed quation were similar for conditions for which hey were derived, the proposed equations proved o be more accurate over a wider range of thermal oading and fetch length conditions. (Sink-Penn St)
V79-01895

ADIATION AND ENERGY BALANCE OF PRINKLER AND TRICKLE IRRIGATED IELDS,
Ben-Gurion Univ. of the Negev, Beersheba Israel). Inst. of Soil and Water.
For primary bibliographic entry see Field 3F.
V79-01990

2E. Streamflow and Runoff

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 2A.
W79-01899

PARTIAL AREA RESPONSE ON SMALL SEMIARID WATERSHEDS,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
L. J. Lane, M. H. Diskin, D. E. Wallace, and R. M. Dixon.
Water Resources Bulletin, Vol. 14, No 5, p 1143-1158, October 1978. 3 fig, 7 tab, 17 ref.

Descriptors: *Watersheds(Basins), *Semiarid climates, *Runoff, *Infiltrometers, Overlabd flow, Model studies, Erosion, Hydrology, Simulation, *Partial-area response, Semiarid watersheds, Distributed nonlinear model.

Significant errors in estimating surface runoff and erosion rates are possible if a watershed is assumed to contribute runoff uniformly over the entire area, when actually only a portion of the entire area may be contributing. The reported research was directed to develop analysis techniques for partial area response on small arid watersheds. Generation of overland flow on portions of such watersheds was analyzed by 3 methods: an average loss rate procedure, a lumped-linear model, and a distributed nonlinear model. These methods suggested that, on the average, 40 to 60% of the drainage area was contributing runoff at the watershed outlet. Infiltrometer data supported the partial area concept and indicated that the low infiltration zones are the runoff sources as simulated with the distributed nonlinear model. (Singh-ISWS)
W79-01916

IMPACT OF URBANIZATION ON THE HYDROLOGY OF WAIRAU CREEK, NORTH SHORE, AUCKLAND,
Auckland Univ. (New Zealand). Dept. of Geography.
P. W. Williams.
Journal of Hydrology (New Zealand), Vol. 15, No. 2, p 81-99. 1976. 15 fig, 11 ref.

Descriptors: *Urbanization, *Urban hydrology, *Urban sociology, Sediment yield, Floods, Flood frequency, Suspended load, Foreign countries, Foreign research, Effects, *New Zealand, *Auckland(New Zealand), *Wairau Creek(New Zealand), Sediment rating curves.

Hydrological changes that have occurred as a consequence of the urbanization of a small catchment of 11.4 sq km on the North Shore of Auckland were examined. The catchment is developed mainly on relatively impermeable siltstones and fine sandstones. It originally had a cover of subtropical evergreen rain forest, but by 1940 the catchment area was predominantly grassland and scrub. In 1959, almost 3/4 of the catchment was covered in bush, scrub, and grassland, but by 1975 almost 3/4 of the basin was in urban uses. Hydrological records that commenced in 1962 indicated that up to the present the number of small floods contained within the channel have increased 5 times and that the number of large floods has also increased, especially since the channel was lined with concrete. In general, there appears to be an inverse relationship between flood frequency increase and flood magnitude. Flood hydrographs also have changed over the period, becoming much more peaked. Floods now strike more swiftly, rish higher, and run off more rapidly than before urbanization. Sedimentation also has increased. Suspended sediment concentration in storm drainage from a neighboring East Coast Bays residential subdivision attained 59,000 mg/l, which is as high as any concentration ever recorded in New Zealand. In the Wairau Creek catchement, preliminary sediment rating curves were constructed for tributary streams draining areas of different land use. It was concluded that, even when residential areas become established, sediment yield remains unexpectedly high. Silt discharge from the Wairau basin contributes to sedimentation of the estuary at Milford and incurs considerable costs for de-silting the marina. Environmental costs arising from flooding and siltation were estimated, and it was concluded that the costs are not being borne by those that produce them, but are being transferred to the community. (Lee-ISWS)
W79-01922

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01947

THE HYDROLOGY OF KARST URBAN AREAS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 2A.
W79-01948

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 7C.
W79-01989

2F. Groundwater

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 8B.
W79-01503

EXPERIENCE IN ARTIFICIAL GROUNDWATER RECHARGE FOR WATER SUPPLY IN LITHUANIA,
For primary bibliographic entry see Field 4B.
W79-01508

SIMULATION OF FLUID-ROCK INTERACTIONS IN A GEOTHERMAL BASIN,
Systems, Science and Software, La Jolla, CA.
S. K. Garg, T. R. Blake, D. H. Brownell, Jr., A. H. Nayfeh, and J. W. Pritchett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 550, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. NSF-RA-N-75-329, September 1975. 65 p, 11 fig, 26 ref. NSF GI44212.

Descriptors: *Geothermal studies, *Thermal water, *Model studies, *Mathematical models, Heat transfer, Heated water, Temperature, Borehole geophysics, Faults(Geologic), Rocks, Flow, Groundwater, Groundwater movement, Reservoirs, Computers, Porous media, Equations, Analytical techniques, Fluid-rock interactions.

General balance laws and constitutive relations were developed for convective, hydrothermal, geothermal reservoirs. A fully interacting rock-fluid system was considered; typical rock-fluid interactions involved momentum and energy transfer and the dependence of rock porosity and permeability upon the fluid and rock stresses. The mathematical model also included multiphase (water/steam) effects. A simple analytical model was employed to study heat transfer into or from a fluid moving in a porous medium. Numerical results showed that for fluid velocities typical of geothermal systems (Reynolds number much less than 10), the fluid and the solid may be assumed to be in local thermal equilibrium. Mathematical formalism of Anderson and Jackson was utilized to derive a continuum species transport equation for flow in porous media; this method allows one to delineate, in a rigorous manner, the convective and diffusive mechanisms in the continuum representation of species transport. An existing computer program (QUAGMR) was applied to study upwelling of hot water from depth along a fault; the numerical results can be used to explain local temperature

inversions occasionally observed in bore hole measurements. (Sims-ISWS)
W79-01516

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01522

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W79-01557

DOLOMITIZATION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Water Resources Research Center.
A. F. Randazzo, and E. W. Hickey.
American Journal of Science, Vol. 278, p 1177-1184, October, 1978. 2 fig, 2 plates, 2 tab, 21 ref. Paper presented at the Second International Symposium on Water-Rock Interaction, Strasbourg, France, 1977. OWRT B-032-FLA(2), 14-34-0001-7148.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Groundwater resources, *Aquifer management, *Limestones, *Petrography, *Water management, *Aquifers, *Facies, *Diagenesis.

Multiple transgressive-regressive cycles of sedimentation characterize 20 cores penetrating the Floridan Aquifer. Original texture is preserved more frequently in rocks deposited in a supratidal environment and replaced by stoichiometric dolomite. Non-stoichiometric dolomite commonly is associated with obscured or obliterated limestone fabrics. Strontium in both dolomite groups generally is less than 250 ppm and indicates crystallization in a solution less saline than seawater. Dolomitization continued with time as rocks of supratidal and other environments of the area were subjected to repeated lateral migrations of a saltwater-freshwater interface and phreatic groundwaters. (Morgan-Fla)
W79-01749

GEOCHEMICAL INTERPRETATION OF KINGS MOUNTAIN, NORTH CAROLINA, ORIENTATION AREA,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W79-01912

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN TERRY COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01927

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN YOAKUM COUNTY TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin
For primary bibliographic entry see Field 7C.
W79-01928

OCCURRENCE AND QUALITY OF GROUND WATER IN BAYLOR COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01929

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN COCHRAN COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01930

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LUBBOCK COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
For primary bibliographic entry see Field 7C.
W79-01931

HYDROLOGIC PROBLEMS IN KARST REGIONS.
Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky. 1977. 481 p. Dilamarter, R.R., and Csallany, S.C., editors.

Descriptors: *Conferences, *Karst hydrology, *Karst, *United States, *Groundwater, *Hydrogeology, Subsurface drainage, Land subsidence, Computer models, Model studies, Aquifers, Foreign countries, Foreign research, Water quality, Water wells, Limestones, Carbonate rocks, Caves, Hydrologic aspects, Groundwater movement, Aquifer characteristics, Water supply, Water pollution, Aquifer systems, Groundwater resources, Sinks.

Karst regions - areas underlain by easily dissolved rock such as limestone - generally present unique water-related problems. Water supply and quality, drainage, and general land use problems require approaches that may differ considerably from those used in non-karst areas. The articles in this volume called attention to the close surface-subsurface relationships in karst regions and to a wide array of problems, approaches, study techniques, and possible solutions. Written by individual contributors from the United States and several other countries, the articles ranged in scope from theoretical to applied. Beginning with a general background of karst regions and their relation to hydrologic problems, the articles encompassed some geophysical techniques for study, computer simulation of surface watersheds, karst aquifer investigations, including groundwater flow, wells and water supply, and concluded with problems of water quality and construction. The book can serve engineers, scientists, administrators, planners, and others interested in hydrologic problems in karst regions. (See W79-01933 thru W79-01977) (Humphreys-ISWS)
W79-01932

PROGRESS OF KNOWLEDGE OF HYDROLOGY OF CARBONATE ROCK TERRANES - A REVIEW,
Geological Survey, Reston, VA. Office of the Chief Hydrologist.
V. T. Stringfield,, and J. R. Rapp.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 1-9, 1977. 39 ref.

Descriptors: *Reviews, *Karst hydrology, *Carbonate rocks, Groundwater, History, Groundwater movement, Aquifers, Hydrology, Karst, Limestones, *Greece.

The early theories of water in carbonate rocks related chiefly to the source of movement of the water. The presence of caves, springs, and other karst features in carbonate rocks of Greece and surrounding countries had an influence on the ancient Greek philosophers who attempted to explain the hydrologic cycle. Since the early part of the present century, considerable progress has been made in understanding the hydrology of carbonate rocks, although some investigators still disagree on some features such as the nature of the occurrence and movement of water in these rocks. In the past decade there has been a large increase in interest in carbonate rocks, especially their hydrologic characteristics. That interest is indicated by the rapid increase in the number of investigations of water resources and of environmental problems in carbonate rock terranes. Interest also is indicated by the work at many national and international scientific meetings as shown by the appointment of work groups to study the hydrology of carbonate terranes as part of the International Hydrological Decade and the International Association of Hydrogeologists. The recent literature includes many reports on the results of scientific investigations, glossaries of karst terminology, a comprehensive annotated bibliography of carbonate rocks, and several books on karst. Increased interest in carbonate rock hydrology has caused an increase in some activities such as geochemical and geophysical research, including aerial remote sensing, but research is also continuing along other fronts. Environmental studies of carbonate rock terranes are becoming more urgent as populations and industry continue to expand into these terranes. (See also W79-01932) (Humphreys-ISWS)
W79-01933

KARST HYDROLOGY RELATED TO ENVIRONMENTAL SENSITIVITY,
H. E. LeGrand.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 10-18, 1977. 1 tab, 7 ref.

Descriptors: *Karst hydrology, *Groundwater, *Environment, Hydrological aspects, Karst, Carbonate rocks, Hydrogeology, Paleohydrology, Topography, Environmental problems.

The significant increase in knowledge of karst features and processes of karst hydrology in the past 20 years has not been followed by an equal increase in capability of managing the hydrologic problems in karst regions. Distinctive features of many karst regions include scarcity of soils, scarcity of surface streams, and rugged topography; less distinctive are some highly permeable and cavernous rocks, especially at shallow depths. A characteristic great range in permeability gives rise to many significant problems, including (1) scarcity and poor predictability of groundwater supplies, (2) scarcity of surface streams, (3) instability of the ground, (4) leakage of surface reservoirs, and (5) an unreliable waste-disposal environment. The delicate natural hydrological balances within a karst region can be disturbed easily, and advantages gained by altering the hydrology may be offset by various detrimental effects. A serious handicap in preventing and solving management problems of karst regions is the overall lack of framework for evaluation and study. A growing tendency to concentrate and rely on sophisticated and advanced hydrological techniques at too early a stage may produce results of limited value. Best results are obtained by starting with a basic framework of principles of karst hydrology with which specific available information on the karst setting can be meshed to get useful early approximations. Additional data and inferences in connection with appropriate advanced hydrologic techniques logically follow. A checklist of karst features and hydrologic conditions for use in evaluation of karst hydrology was prescribed. (See also W79-01932) (Humphreys-ISWS)
W79-01934

KARSTIC INSTITUTIONAL CONFLICTS AND OPPORTUNITIES,

ppalachian Regional Commission, Washington, C. Energy, Environment and Natural Resources iv.
or primary bibliographic entry see Field 6E.
/79-01935

CONTRIBUTION TO THE STUDY OF THE ROBLEM OF KARST REGIONALIZATION,
istitute for Geological and Geophysical Research, Belgrade (Yugoslavia).
I. Komatina.
n: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky niversity, Bowling Green, Kentucky, April 26-9, 1976. Department of Geography and Geology, Vestern Kentucky University, Bowling Green, entucky, p 32-40, 1977. 5 fig, 4 ref.

Descriptors: *Karst, *Geology, *Regional development, Foreign countries, Drainage area, Springs, inks, Geomorphology, *Yugoslavia.

One of the proper approaches to karst regionalization should be based on the 'geotectonic criterion,' vhich integrates all geological elements significant or the formation of carbonates and for the development of karstification. The general aspects of egionalization were considered in this light, with eference to hydrogeological features of typical arst regions of the Outer Dinarides of Yugoslavia. The analysis included specific drainage areas vithin the outer (coastal) and inner karst belts. egionalization of karst was related to the quantitative treatment of a medium and its water. (See lso W79-01932) (Humphreys-ISWS)
V79-01936

KARST TOPOGRAPHY AND ITS OCCURRENCE IN KENTUCKY,
Vestern Kentucky University, Bowling Green, KY. Dept. of Geography and Geology.
. D. Whitley.
n: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky Jniversity, Bowling Green, Kentucky, April 26-9, 1976. Department of Geography and Geology, Vestern Kentucky University, Bowling Green, Kentucky, p 41-49, 1977. 2 fig, 11 ref.

Descriptors: *Karst, *Topography, *Kentucky, Geomorphology, Drainage, Caves, Regional development, Carbonate rocks, Sinks, Shape, Springs.

Selected aspects of karst processes and resulting opography and drainage were reviewed. Solution rocesses, drainage characteristics, and surface and ubsurface topographic features were summarized rom existing literature. The interior lowlands of entral Kentucky include excellent examples of arst regions. The limestone beds of the area are Carboniferous (Mississippian). In the far north, the imestone is covered by glacial deposits, but in the outhwestern portion of the state the limestone is generally covered only by shallow soil. Karst has leveloped on two distinct landform units. Located n the southwestern portion of this region is the lain known as the Pennyroyal and to the northvest is the Mammoth Cave Plateau, also referred o as the Chester Cuesta. The Dripping Springs Chester) Escarpment serves as a boundary beween the two. On a topographic map this is a very listinctive feature with relief of 65 to 130 m. From he ground it is less noticeable because of dissection that has altered it. In general, the karst area of Kentucky varies a slight degree from one area to nother. Landforms in different stages of development may be noted, and the occurrence of caves varies to some degree. Yet, the landforms which re present are unmistakable landforms of karst opography. (See also W79-01932) (Humphreys-ISWS)
W79-01937

REVIEW OF THE PHYSICAL HYDROLOGY OF THE CENTRAL KENTUCKY KARST,
National Park Service, Mammoth Cave, KY. Uplands Research Lab.
J. F. Quinlan, and D. . Rowe.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 50-63, 1977. 6 fig, 18 ref. OWRT A-062-KY(2).

Descriptors: *Karst hydrology, *Kentucky, *Groundwater, *Groundwater basins, Water pollution, Reviews, Karst, On-site investigations, Tracers, Sinks, Limestones, Caves, Aquifers, Groundwater movement, Drainage area, Hydrologic aspects, Stratigraphy, Geology, Drainage system, Subsurface drainage.

The Pennyroyal Plateau in central Kentucky consists of the Sinkhole Plain and the Glasgow Upland - each of which is underlain by Mississippian carbonates that gently dip in directions ranging from north to west. The Sinkhole Plain is flanked on the north by the sandstone-capped Chester Escarpment and Chester Cuesta. The occurrence and movement of groundwater in the Principal Aquifer is traced from the highest recharge area, just beyond the south and east margin of the Sinkhole Plain. Water is found in numerous small swamps of the Glasgow Upland, which feed perennial springs that feed streams that sink at this margin. Water from the swallets flows to cave streams. These low-order tributary streams join intermediate-order tributaries and, finally, a high-order trunk stream that discharges at a major spring along Green River, Barren River, or Little Barren River. The streams that flow beneath the Sinkhole Plain are fed also by runoff into sinkholes and direct infiltration. The streams that drain beneath the Chester Cuesta may be fed not only from the Sinkhole Plain, but also by runoff from ridge tops, infiltration from karst valleys, and by spring discharge from two perched aquifers. Dye-tracing over distances of as much as 24 km has begun to delineate the major groundwater basins. Systematic location of numerous caves and sinkholes in which subsurface streams are intercepted as they flow to their base level outlet, as well as mapping of selected major caves that serve as groundwater conduits, has yielded unique and valuable information about the nature of the dendritic plumbing system that drains the upper part of the Principal Aquifer. Thirteen groundwater basins have been recognized; all but 2 of them are characterized by distributary complexes 50 m to 4 km wide which discharge at 1 or several springs at each of 2 to 14 locations. Only 1 regional spring, Turnhole, lacks a distributary complex. Trunk conduits are commonly as much as 14 m wide. Water levels in them fluctuate as much as 30 m in response to storms. (See also W79-01932) (Humphreys-ISWS)
W79-01938

SUMMARY OF GEOHYDROLOGIC RELATIONSHIPS IN THE LOST RIVER WATERSHED, INDIANA, APPLIED TO WATER USE AND ENVIRONMENT,
Indiana Univ. at Bloomington. Dept. of Geology.
R. V. Ruhe.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, april 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 64-78, 1977. 7 fig, 27 ref.

Descriptors: *Karst hydrology, *Hydrogeology, *Watersheds(Basins), *Indiana, Geomorphology, Sinks, Reviews, Karst, Aquifers, Water balance, Geology, Climate, Hydrology, Hydrological aspects, Water quality, *Lost River(Indiana).

Quantitative relations among surface water and groundwater hydrology and geomorphology and soils were evaluated. Principles were formulated for defining karst-aquifer features that control water balance. Specific goals were to determine the hydrologic system of the karst of the Mitchell Plain of south central Indiana. Study topics include: (1) geomorphology of the karst terrain including surface materials and bedrock topography relative to sinkholes, etc.; (2) soils, including retention and storage capacity, permeability and transmissivity, and ability to enhance runoff; (3) water budget, including runoff, evapotranspiration, subsurface flow, spring flow, subsurface storage, and hydrochemical nature of the water; and (4) water use and environment, including water supply and potential contamination. Sample areas were selected as models for field and laboratory work and fitted to the watershed for quantitative estimate of the whole system. (See also W79-01932) (Humphreys-ISWS)
W79-01939

A PRELIMINARY INVESTIGATION ON SEISMIC TECHNIQUES USED TO LOCATE CAVITIES IN KARST TERRAINS,
Chester Engineers, Inc., Coraopolis, PA. Geotechnical Dept.
K. G. Kirk, and E. R. Snyder.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 79-91, 1977. 12 fig, 7 ref.

Descriptors: *Karst, *Exploration, *Seismic studies, *Subsurface investigations, *West Virginia, Seismology, Geology, On-site tests, Surveys, Seismic waves, Limestones, Instrumentation, Theoretical analysis, Analytical techniques, Seismographs, Data processing, Caves, *Organ Cave(WVA).

Shallow hammer reflection seismology was used in conjunction with a signal enhancement seismograph in an attempt to locate cavities in karst terrains. The use of compressional wave (P wave) reflections and shear (SH) wave reflections was investigated to determine their usefulness in locating cavities. Results indicated that both P and SH wave reflections can be used to locate cavities. The SH wave reflections appear to delineate cavities better than P wave reflections. Success with this technique so far suggests that it can be used as a useful tool in engineering reconnaissance and land use planning. (See also W79-01932) (Humphreys-ISWS)
W79-01940

THE A, B, C'S OF FINDING AND DELINEATING CAVES WITH APPARENT RESISTIVITY MEASUREMENTS,
Monongahela National Forest, Elkins, WV.
T. R. Manley, and E. R. Garton, Jr.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 92-95, 1977. 4 fig.

Descriptors: *Caves, *Karst, *Locating, *West Virginia, Exploration, Methodology, Surveys, Electrical resistivity, Resistivity, Limestones, Analytical techniques.

During investigation into the effects of highway construction on the hydrogeologic environment at Bowden, West Virginia, a technique for finding and delineating limestone caverns from the surface was developed. These caverns are aquifers to the large springs which supply the Bowden National Fish Hatchery with water for all of its operations. The technique use for finding and delineating these caves was apparent resistivity measurements. After interpretation of these measurements, the results were confirmed with boreholes. (See also W79-01932) (Humphreys-ISWS)
W79-01941

GEOPHYSICAL INVESTIGATIONS OVER KARST WATER IN SOUTHEASTERN MISSOURI,
Rhode Island Univ., Kingston. Dept. of Geology.
R. K. Frohlich, and G. P. Smith.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green

Kentucky, p 96-106, 1977. 9 fig, 1 tab, 7 ref. OWRT A-065-MO(2).

Descriptors: *Karst, *Missouri, *Exploration, *Geological surveys, Karst hydrology, Geophysics, Sounding, Electrical studies, Aquifers, Gravity studies, Geology, Resistivity, Surveys, Limestones.

The disappearance of streams and the subsurface transport of water through cavities and stream channels occur frequently in karst terranes. A characteristic area of such phenomena is the southeastern part of Missouri. The disappearance of a small river in this area is believed to be fault-controlled. Geoelectrical depth soundings and gravity investigations produced anomalies, which can be explained by near surface river deposits and the local karst development. The depth soundings after Schlumberger indicate a conductive overburden between 40 and 50 m. No significant change of its thickness profile shows a negative anomaly of -2.0 mgal with a width of nearly 4.5 km. Simplified model calculations consider the external gravity effect caused by the density contrast of karstified versus compact limestone. An almost equal contribution to the gravity anomaly originates from the density contrast of alluvial river deposits versus karstified limestone. The semiquantitative gravity interpretation suggests larger depths of karstification than the thickness of the geoelectrically observed overburden implies. Small-scale limestone dissolutions in the order of 10% can produce substantial gravity lows. However, this would not show on a resistivity depth sounding if the fissures are filled with air or clear water. The gravity survey suggests that extensive karstification occurred near the fault planes. The material, most likley, consists of a weaker rock near the fault than in the surrounding area. The mechanicaly weaker rock is more subject to chemical dissolution when it comes in contact with erosional water. (See also W79-01932) (Humphreys-ISWS)
W79-01942

ALPHA RADIATION MONITORING OF NATIONAL PARK SERVICE ADMINISTERED CAVES IN UNITED STATES,
National Park Service, Santa Fe, NM. Southwest Region.
K. A. Yarborough, and G. M. Ahlstrand.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 107-116, 1977. 1 tab, 6 ref.

Descriptors: *Caves, *Radiation, *Monitoring, *United States, *Public health, Radioactivity, Background radiation, Hazards, Standards, Surveys, On-site investigations, Radioisotopes, Alpha radiation, Radiation exposure, Radon gas, Thoron gas.

The United States National Park Service (NPS) has conducted a preliminary survey of alpha radiation in NPS administered caves. This radiation is produced by the radioactive decay of Radon and Thoron gases, which in turn result from Uranium and Thorium decay. These latter elements are found in all terrestrial rocks and soils in varying, though minute, concentrations. The decay products of the two noble gases which cause a potential health hazard are the short lived 'daughters.' These are solids. This decay yields the alpha radiation which as a large ionizng effect on lung tissues. Continuous exposure of many years (5 or more) may cause lung cancer. Lung cancer has been documented to be anomalously high among uranium miners. Smoking has a contributory effect which greatly increases the radiation health hazard. Health standards are set by several government agencies: Environmental Protection Agency, Occupational Safety and Health Administration, Mining Enforcement and Safety Administration (MESA), and National Institute for Occupational Safety and Health. The NPS research has the dual but complementary objectives: (1) To safeguard health at the NPS administered caves, and (2) To develop data on alpha radiation levels and on natural airflows in caves. The results can be used by various agencies to clarify health standards for exposures to lower radiation levels in cave environments. All persons who spend considerable time underground in caves may be exposed to alpha radiation produced by the radioactive decay of radon and thoron gases. Therefore, underground areas should be monitored for this radiation, and exposures should be computed using the procedures, equipment, and standards of MESA and other agencies as described. (See also W79-01932) (Humphreys-ISWS)
W79-01943

DISTRIBUTION AND DENSITY OF DOLINES IN AREAS OF MANTLED KARST,
Iowa State Univ., Ames. Dept of Earth Sciences.
R. C. Palmquist.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky Univ., Bowling Green, Kentucky, p 117-129, 1977. 8 fig, 2 tab, 16 ref.

Descriptors: *Karst, *Iowa, *Geological investigations, Surveys, Glacial drift, Statistical methods, Analysis, Analytical techniques, Distribution patterns, Spatial distribution, *Dolines, Mantled karst.

The karstic area of Iowa is mantled with drift of Nebraskan, Kansan, and Wisconsinan ages. Ansalysis of doline densities within these drift sheets and of doline distribution within a portion of the Nebraskan drift sheet indicated both temporal and environmental controls. Doline density varies directly with the age of the land surface according to a log age model. This model suggested that doline initiation occurs about 5,000 years after the surface originates with very rapid decrease in the rate of doline initiation occurring about 250,000 years after surface origination. Within two townships in Allamakee County, doline density varies with local environmental controls. Multiple regression analysis indicated that the density of major dolines varies inversely with local relief and extent of surface drainage, but directly with area of Fayette soil. The density of minor dolines varies directly with area of Fayette soil and inversely with local relief. These relationships were interpreted to indicate that the major control on doline density is the amount of groundwater recharge, though for major dolines, aquifer permeability and lithology are also important. (See also W79-01932) (Humphreys-ISWS)
W79-01944

MORPHOMETRIC ANALYSIS OF DOLINES FOR PREDICTING GROUND SUBSIDENCE, MONROE COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
A. E. Ogden, and J. P. Reger.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green Kentucky, p 130-139, 1977. 10 fig, 3 tab, 8 ref.

Descriptors: *Karst, *West Virginia, *Land subsidence, *Geomorphology, Subsidence, Limestones, Analysis, Analytical techniques, Geology, Carbonate rocks, Stratigraphy, *Dolines, *Monroe County(W Va), Greenbrier limestone.

Morphometric analysis of dolines shows promise as a useful tool in identifying ground subsidence susceptibility for land use planning. Seven carbonate formations of the Greenbrier limestone group were mapped in central Monroe County, West Virginia, on 7.5-min topographic maps. A doline map was prepared from aerial photographs and transferred to similarly scaled maps. Results indicated different formations with the Greenbrier limestone process relatively distinctive doline distributions. The percentage of limestone area in dolines and the doline density (number of dolines per square mile of limestone are useful indicators of areas of potential subsidence and, furthermore, coincide with total cave footage. The implication is that areas underlain by the most cavernous rock units display the greatest areal and frequency percents of dolines. A ground subsidence susceptibility map, combining areas of optimum hillslope steepness and percent area in dolines, shows those areas considered the most suitable for locating major manmade structures. It was concluded that, in general, the Pickaway limestone is the single most suitable formation upon which to build major structures with minimum risk of subsidence, whereas the Patton and Union formations should be avoided. (See also W79-01932) (Humphreys-ISWS)
W79-01945

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

CONCEPTUAL MODELS FOR CARBONATE AQUIFERS: REVISITED,
Pennsylvania State Univ., University Park. Materials Research Lab.; and Pennsylvania State Univ., University Park. Dept. of Geosciences.
W. B. White.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 176-187, 1977. 4 fig, 2 tab, 13 ref.

Descriptors: *Karst hydrology, *Aquifers, *Model studies, *Hydrogeology, *Unsteady flow, Carbonate rocks, Base flow, Groundwater, Geology, Karst, Petrology, Subsurface waters, Flow, Water balance, Hydrographs, Discharge(Water), Perched water, Drainage area.

A conceptual scheme for classifying carbonate aquifers in terms of groundwater flow system and hydrogeologic setting originally proposed in 1969 was revised and extended to include factors of relief, structure, and areal extent of the aquifer. Structural and topographic setting was shown to act mainly through determining the arrangement of karstic rocks with respect to sources of recharge and points of discharge. Lithologic and stratigraphic factors control the degree to which conduit permeability is developed. It was shown that a distinction between diffuse flow (fracture) aquifer systems and conduit flow systems can be made in terms of their response to transient recharge events. The effects of transients is more pronounced in aquifer systems of high relief. The vaue of conceptual classifications is that they permit one to identify particular aquifer types and also indicate some of the variables that should be incorporated into quantitative models of aquifer behavior. (See also W79--6423 and W79-01932) (Humphreys-ISWS)
W79-01949

STORAGE PROPERTIES OF FRACTURED FORMATIONS,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 188-192, 1977. 1 tab, 3 ref.

Descriptors: *Aquifers, *Water storage, *Model studies, *Karst, Mathematical models, Permeability, Porosity, Flow, Equations, Analytical techniques, Fracture permeability, Deformation, Theoretical analysis, Water wells, Pumping.

Response mechanism of a fractured aquifer to a pressure change due to pumping was considered. An aquifer in a state of equilibrium is characterized by a certain form of the stress-strain relationship.

This defines the state of stress within the aquifer, in both the solid skeleton of the rock and the fluid in the voids of the rock. Every change in the state of stress produces a certain change in the stress-strain-time relationship; pore pressure decline causes compression of the rock's skeletal structure and expansion of the fluid contained in the voids, while increase in the fluid pressure causes expansion of the solid skeleton and compression of the fluid. A certain amount of time is required for a new specific stress-strain relationship to occur. A general differential equation for the flow to a well was derived. (See also W79-01932) (Humphreys-ISWS)
W79-01950

FAULTS AS POSITIVE AND NEGATIVE INFLUENCES ON GROUND-WATER FLOW AND CONDUIT ENLARGEMENT,
Texas Univ. at Austin. Dept. of Geological Sciences; and Texas Univ. at Austin. Bureau of Economic Geology.
E. H. Kastning.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 193-201, 1977. 5 fig, 12 ref.

Descriptors: *Karst, *Faults(Geologic), *New York, *Virginia, *West Virginia, *Texas, Flow, Groundwater movement, Hydrology, Base flow, Carbonate rocks, Caves, Aquifers, Fractures(Geologic), Springs, Flow control, Fault zones.

Faults and fault zones within rocks generally are regarded as zones of higher permeability and of greater dissolutional enlargement of conduits than are joints or bedding-plane partings within an aquifer. These views are generally correct. However, recent investigations have indicated that, in some cases, faults have either not influenced karst groundwater flow, or have behaved as insoluble zones, retarding groundwater movement. Faults act as positive influences on groundwater flow where they have increased permeability by increasing fracture density or structurally weakening the bedrock. As negative influences, faults impede groundwater flow at an impermeable fault-plane, divert flow to other horizons, direct flow along the fault plane, or force waters to surface springs. Futhermore, flow paths have been unaltered by faults in some cases. The effects of faults vary with the structure and texture of the fault surfaces which, in turn, are determined by limestone composition, local pressure-temperature relationships during tectonism, and the nature of compressional or tensional forces during faulting. As no general statement of fault influence on the karst groundwater regime or conduit development can be made, each fault in question must be examined in detail. (See also W79-01932) (Humphreys-ISWS)
W79-01951

MODEL ANALYSIS OF CLOSED SYSTEMS IN KARSTIC AQUIFERS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
Y. Basmaci, and L. V. A. Sendlein.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 202-213, 1977. 7 fig, 1 tab, 19 ref.

Descriptors: *Karst, *Aquifers, *Model studies, *Groundwater movement, Baseflow, Numerical analysis, Computer models, Analysis, Analytical techniques, Mathematical models, Flow, Unsaturated flow, Saturated flow, Steady flow.

Computer simulation of cross sectional models examined the variations in groundwater behavior in karstic terrains using a steady-state groundwater flow equation. This equation is capable of solving flow in unsaturated and saturated media and is thus suitable for karstic models. Adaptation to karstic models requires the consideration of directional permeability of the regolith, effects of point and diffuse discharge, and precipitation. Preliminary results illustrated the interrelationships between granular and solution-channel flow systems. Some of these results were: (1) granular flow patterns prevail as long as vertical permeability approximates horizontal permeability; and (2) topography plays an important role in concentrating pressure head drop along steep slopes. (See also W79-01932) (Humphreys-ISWS)
W79-01952

FLOW TO A WELL IN AN UNCONFINED FRACTURED AQUIFER,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 214-227, 1977. 8 fig, 4 ref.

Descriptors: *Aquifers, *Karsts, *Groundwater movement, *Model studies, *Drawdown, Fissures(Geologic), Flow, Pumping, Water levels, Groundwater, Theoretical analysis, Mathematical studies, Mathematical models, Analytical techniques, Equations, Wells, Water wells.

A new equation was derived for the fissure flow drawdown in a fractured aquifer under water table conditions. The abstraction well, which is pumped at a constant rate, is of full penetration. The fractured aquifer is assumed to consist of the block-and-fissure units. The compressibility of both the porous blocks and their adjoining fissures is taken into account. Flow in the blocks is assumed to be vertical, and flow in the fissures is horizontal. An equation for the flow in blocks was derived. A critical discussion of the theory for the flow of groundwater in fissured rocks was given. (See also W79-01932) (Humphreys-ISWS)
W79-01953

WATER WELL PRODUCTIVITY RELATED TO PHOTO-LINEAMENTS IN CARBONATES OF FREDERICK VALLEY, MARYLAND,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
M. P. LaRiccia, and H. W. Rauch.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 228-234, 1977. 4 fig, 1 tab, 4 ref.

Descriptors: *Karst, *Aquifers, *Water yield, *Surveys, *Maryland, Hydrogeology, Groundwater, Water supply, Limestones, Water wells, Geology, Topography, Surfaces, Analysis, Areal hydrogeology, Specific capacity, Fissures(Geologic), *Frederick Valley(MD), Lineaments, Photo-lineaments.

The effect of photo-lineaments on water well productivity and drawdown was investigated for 65 domestic wells in the Grove and Frederick limestones of Frederick Valley in Frederick County, Maryland. Well information was obtained from Geological Survey data published by the Maryland Geological Survey, while photo-lineaments were mapped on both low altitude and high altitude black and white aerial photographs. Well productivity (both specific capacity and specific capacity index) was found to be significantly higher for pumped wells within 100 feet of a lineament compared with more distant wells, for both the Grove and Frederick limestones. For specific capacity, the near-lineament and off-lineament wells averaged 1.79 and 0.13 gallons per minute per foot of drawdown (gpm/ft), respectively, for the Frederick Limestone, while the Grove Limestone averaged 0.52 and 0.16 gpm/ft, respectively, for near-lineament and off-lineament wells. This indicates that at least short photo-lineaments are usually associated with higher transmissivities in underlying carbonate aquifers, within a zone at least 100 feet in width on either side of a lineament. Such lineaments, therefore, can be used as a prospecting tool for locating high capacity water wells in karst terrains. However, no significant differences in well productivity exist for near-lineament wells with respect to photo-lineament type (stream channel versus tonal-depression), well orientation near a lineament, and nearest lineament orientation. (See also W79-01932) (Humphreys-ISWS)
W79-01954

GROUNDWATER POTENTIAL OF THE KARST REGIONS OF ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
G. Ozoray.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 235-240, 1977. 1 fig, 23 ref.

Descriptors: *Karst, *Canada, *Groundwater potential, *Hydrogeology, Water supply, Aquifers, Limestones, Carbonate rocks, Geology, Water balance, *Alberta(Canada).

The mountain karst of the Cordilleran area (about 17,500 sq km) has a considerable karst water potential, by conservative estimation about 2 cu km annually. The quality of the water is excellent. Presently this potential is unused. Due to increasing demand, a substantial escalation in the use of karst waters is predicted for the near future. Systematic field observation, especially spring yield measurements, are needed to compute a water balance of the mountain karst area. The water of the Athabasca shallow buried karst and that of the deeply buried karst is chemically unsuitable for water supply, although it could be used for medical purposes and as industrial raw material. (See also W79-01932) (Humphreys-ISWS)
W79-01955

GROUND-WATER DEVELOPMENT PROBLEMS ASSOCIATED WITH FOLDED CARBONATE-ROCK AQUIFERS IN THE IRONDALE AREA, ALABAMA,
South Carolina Water Resources Commission, Columbia.
B. C. Springer, and S. L. Graves.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 241-248, 1977. 3 fig, 8 ref.

Descriptors: *Water resources development, *Groundwater resources, *Karst, *Aquifers, *Alabama, Carbonate rocks, Water supply, Subsidence, Water pollution, Geology, Hydrogeology, Folds(Geologic), *Birmingham(Ala).

Carbonate rock aquifers of Paleozoic age are important sources of private, municipal, and industrial water supplies near Birmingham, Alabama. Aquifer contamination, subsidence, local over-development, and well-drilling difficulties are familiar problems associated with Appalachian Valley-type karst aquifers in this area of the folded Valley and Ridge. In and near the City of Irondale, a suburb of Birmingham, southeastward dipping carbonate rocks of Mississippian age supply the majority of groundwater to wells. In 1974, the Bangor Limestone, a shallow unconfined karst aquifer, was contaminated locally with heavy metals resulting in the pollution and abandonment of a municipal well at Irondale. However, a critical water shortage was avoided by the development of the Fort Payne-Tuscumbia, a deeper confined karst aquifer. Since 1969, the Fort Payne-Tuscumbia aquifer has been developed more widely in the Valley and Ridge of Alabama. High-yielded wells, such as the wells at Irondale, have been located and developed in the Fort Payne-Tuscumbia aquifer. The wells provide maximum possible protection against contamination and subsidence. Unfortunately, there are no rules for locating high-yielded wells in folded carbonate-rock aquifers. It is certain, how-

ever, that well-site selection must be a thorough process, and applicable to the local geohydrologic environment. (See also W79-01932) (Humphreys-ISWS)
W79-01956

HYDROGEOLOGY OF A CAVE UTILIZED FOR PUBLIC WATER SUPPLY: RIO CAMUY CAVE, PUERTO RICO, U.S.A.,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
B. F. Beck.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 249-261, 1977. 6 fig, 33 ref.

Descriptors: *Hydrogeology, *Puerto Rico, *Exploration, *Caves, On-site tests, Groundwater, Water supply, Geology, Karst, Hydrology, Climates, Analysis, Evaluation, Karst hydrology, Public water supply.

The Rio Camuy, one of Puerto Rico's major rivers, originates on the igneous terrain of the Central Mountains and flows north across the offlapping Tertiary limestones with their classic karst development. Where the river reaches the Lares Limestone, it sinks underground and flows through the Rio Camuy Cave System for 7 km, finally reappearing near the contact with the more marly Cibao Formation. Another tributary, a river in the Cueva de Los Angeles, joins the Rio Camuy underground. When measured, flow at the sinking point of the Camuy was 25 cu m/min, and the contribution from Cueva de Los Angeles was 22 cu m/min; but the total flow at the resurgence of the system was 92 cu m/min, indicating a major contribution from more diffuse recharge, or the existence of additional unknown trunk conduits. Portions of the cave are inaccessible, but dye tests and hydrochemical studies have demonstrated most of the connections. Within the karst terrain there is a major municipal water supply near the mouth of the Camuy (3,785 cu m/day) and another moderately large rural supply drawn from a well drilled into the Rio Camuy Cave System. This well is 152 m deep, with 35 cm slotted casing from 125 m to the bottom. It passes through the alluvium of the Rio Camuy within the cave and draws most of its flow from this source. Thus, because of its use for public water supply and because of the high pollution potential proven in karst aquifers, it is important that the details of the karst drainage to the Rio Camuy be accurately known to insure protection of this valuable water resource. (See also W79-01932) (Humphreys-ISWS)
W79-01957

CURRENT PROBLEMS IN THE RATIONAL EXPLOITATION OF KARST WATER,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
B. Mijatovic.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 262-278, 1977. 9 fig, 4 ref

Descriptors: *Karst hydrology, *Groundwater potential, *Water supply, *Exploitation, Foreign research, Foreign countries, Aquifers, Groundwater, Springs, Discharge(Water), Groundwater resources, On-site investigations, Evaluation, Analytical techniques, Water resources development, *Yugoslavia.

The basic and most difficult problem in supplying water from karstic areas evolves from fluctuations in the quantity of water from large numbers of springs and other flows. This fact requires answers to the questions if an in what manner technical control measures to regulate flows of karstic water for more efficient exploitation can be used. Several Yugoslavian case studies were described, representing examples of circumstances favorable for the application of artificial improvements. Methods for increasing the volume of stored water and for controlling discharge, with better yields, involve such measures as dams, grout curtains, and drainage galleries. It was emphasized that extensive preliminary hydrogeological investigation is essential to the success of projected control measures. (See also W79-01932) (Humphreys-ISWS)
W79-01958

THE DEVELOPMENT AND MANAGEMENT OF KARST WATER RESOURCES IN THE CITY OF PECS AND ITS VICINITY, HUNGARY,
Vizugyi Igazgatosag, Pecs (Hungary).
K. Fekete.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Boling Green, Kentucky, p 279-285, 1977. 7 ref.

Descriptors: *Karst, *Water resources development, *Water supply, *Groundwater, Springs, Caves, Discharge(Water), Management, Foreign countries, Foreign research, Water quality, *Hungary.

The rapidly growing city of Pecs, in southwest Hungary, obtains its water supply from several sources, including the high karst discussed in this paper. High Karst waters are relatively unpolluted and issue from springs in the hills above the city of Pecs and other communities. Two chief problems exist: the potential for pollution; and the wide fluctuation in discharge during the year. A theoretical model aimed at understanding and utilizing the hydrogeological system was attempted, but the model proved to be of limited usefulness. Trial dams were constructed for storing water inside the cave and fracture systems in hope of regulating discharges. The partial success in damming the systems, and problems with unexpected leakage were discussed. Use of a cave system as a natural pipeline was described. It was concluded that the high karst waters are well worthy of protection and utilization. Cave exploration, water tracing, and trial damming are necessary for further understanding of the systems. A dam at a proper site is needed for regulating the discharges. (See also W79-01932) (Humphreys-ISWS)
W79-01959

ARTIFICIAL WORKS AND EFFICIENT INTERCEPTION OF GROUNDWATER IN KARST,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
M. Komatina.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green Kentucky, p 286-296, 1977. 5 fig, 4 ref.

Descriptors: *Karst, *Groundwater, *Water supply, *Water control, Aquifers, Discharge(Water), Water yield, Hydraulic structures, Springs, Hydrogeology, Water quality, Interception, Foreign countries, Foreign research, *Yugoslavia.

An advanced knowledge of karst aquifers and the results of consolidation works in the region of surface reservoirs have suggested new possibilities for a greater utilization of karst water. This paper gave information about new ways in investigation and water interception for Dinaric karst and karst in general, based on artificial works. The known methods gave relatively low safe yield of groundwater, equalling the lowest discharge, while most of the water remained unused. The future concept of an economic groundwater production must be based on works aimed at a correction of natural conditions, above all a control of discharge. The concept of this problem's solution was considered in several examples of inland and coastal karst. Particular attention was given to Orebic and its vicinity, where many experiments and large-scale water-interception works were accomplished in the last 5 years, with notable results. (See also W79-01932) (Humphreys-ISWS)
W79-01960

EXPLORATION AND ENVIRONMENTAL INVESTIGATION OF THE PEACOCK SPRINGS CAVE SYSTEM,
Suwannee River Water Management District, FL.
D. W. Fisk, and I. S. Exley.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Greem, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 297-302, 1977. 3 fig, 4 ref.

Descriptors: *Springs, *Caves, *Exploration, *Florida, *Karst, Water supply, Recharge, Hydrology, Aquifers, Limestones, Groundwater, Groundwater recharge, On-site investigations, Mapping, Hydrogeology, *Peacock Springs(Fla).

Field investigations at the Peacock Springs Cave System in west-central Suwannee County, Florida, revealed the development of an underwater cave system in response to geologic and hydrologic conditions. With over 15,100 feet of surveyed passage, the cave is one of the longest in the Southeast, and is the longest underwater cave surveyed in the United States. In the deeper sections of the cave, flow into the system provides large-scale recharge of the Floridan Aquifer, the main source of potable water in north Florida. Any future development near the springs would represent a threat to not only the integrity of the cave passages, but also to the local ground waters. (See also W79-01937) (Humphreys-ISWS)
W79-01961

ON THE MANAGEMENT OF KARST AQUIFERS IN SAUDI ARABIA,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
A-A. I. Kashef.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 303-312, 1977. 2 fig, 23 ref.

Descriptors: *Karst, *Aquifers, *Water management(Applied), *Groundwater, Sandstones, Aquifer management, Saline water intrusion, Coasts, Springs, Water resources, Management, Water resources development, Foreign countries, *Saudi Arabia.

The coastal areas in eastern Saudi Arabia lie along the Arabian (Persian) Gulf, where sandstone aquifers are deeply buried or nonexistent. The shallow karst aquifers in these areas already have been extensively developed. The recent urbanization and expansion in industry and agriculture dictate the need to explore new water sources and to introduce sound management practices. The Gulf salt water has already intruded deeply in the coastal aquifers. Although a desalination plant is planned in this area, it is believed that, due to ecological factors, the 2 neglected major karst formations should be studied and developed. Furthermore, attention should be given to groundwater management which is not comprehended under the unique and complex political and socioeconomic structure. The paper summarized some of these problems as well as the current hydrologic conditions. Future water requirements were estimated. Conditions in karst regions in other countries were presented for guidance. Various comments were made to improve water resources management and to attract attention to the threatening degrees of salt water intrusion. (See also W79-01932) (Humphreys-ISWS)
W79-01962

HYDROLOGICAL PROBLEMS OF JUFRA WELL FIELD, LIBYA,
Ohio Univ., Athens. Dept. of Geology.

U. Ahmad.
Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky versity, Bowling Green, Kentucky, April 26-1976. Department of Geography and Geology, stern Kentucky University, Bowling Green, ntucky, p 313-322, 1977. 7 fig, 8 ref.

scriptors: *Aquifers, *Groundwater resources, n-site tests, *Water supply, Hydrology, Karst, cific capacity, Deep wells, Water wells, Data lections, Hydrogeology, Geology, Test wells, alysis, Foreign countries, Foreign research, awdown, *Libya.

e Jufra area is located on the boundary of the -marine Fezzan Basin to the south, the Hamra in to the northwest, and the marine Sirte Basin the northeast. The main aquifer zone at Jufra sists of 45 meters of dolomitic limsetone. Eight ls have been drilled since 1961 near Socna, 15 20 kms northeast of Jufra project. In the Socna ality, the Misda aquifer is Upper Cretaceous estone at a depth of 150-200 meters. This lime-ne is intensely fractured along the Hun Graben der fault zone. Well capacities are variable and re produced by free flow only. Pressures up to atmospheres have been reported. Water com-ition is fairly uniform between 1300-1700 ppm l dissolved solids. In the Socna Town Hall ll, a maximum of 30 meters of drawdown is erved for a total pumpage of 80 million cu M of ter. Contractors for the Council of Agricultural velopment planned the Jufra Agricultural Proj-, a farm settlement plan by which 20 wells uld irrigate 3,000 hectares. The Misda aquifer uld produce 60 million cu M of water per year. e 9 wells drilled to date in the Jufra area have cific capacities 3.6 cu M/HM to 20 cu M/HM, indicate very high initial transmissivities of 0 sq M/D and storage coefficient of 0.000087. ne-drawdown graphs showed the effect of fauly ndaries which were located by air photo inter-tation. The other consultants have predicted the wdown after 50 years to be from 30 to 50 ters, ignoring the boundaries and leakage from deeper aquifer. An attempt to pump 68 million M per from the faultefd Misda aquifer may se serious drawdown in the future. (See also 9-01932) (Humphreys-ISWS)
9-01963

MODEL FOR RELATING LAND USE AND OUNDWATER QUALITY IN SOUTHERN SSOURI,
ark Underground Lab., Protem, MO.
Aley.
Hydrologic Problems in Karst Regions; Proedings of Symposium held at Western Kentucky iversity, Bowling Green, Kentucky, April 26-1976. Department of Geography and Geology, estern Kentucky University, Bowling Green, ntucky, p 323-332, 1977. 5 tab, 6 ref.

scriptors: *Karst hydrology, *Model studies, issouri, *Groundwater, Discharge(Water), Base w, Water quality, Land use, Land management, oundwater recharge, Hydrogeology, On-site in-stigations, Sinks, Springs, Groundwater re-rces, *Missouri Ozarks.

hydrologic model was developed for relating oundwater recharge and groundwater discharge an 1,100 sq mi area in the southern Missouri arks. There are approximately 455,000 acre feet discrete recharge and 265,000 acre feet of dif-e recharge in the area per year. Mean annual nsit water discharge is approximately 200,000 re feet; mean annual storage water discharge is proximately 520,000 acre feet. The hydrologic odel permits land managers and land use planners recognize relative hazards to the groundwater ality of the area. (See also W79-01932) (Hum-reys-ISWS)
79-01964

YDROLOGY OF KARST FEATURES IN EVA-ORITE DEPOSITS OF THE UPPER PER-IAN IN TEXAS,
eological Survey, Reston, VA. Water Resources Div.
R. C. Baker.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 333-339, 1977. 4 fig, 7 ref.

Descriptors: *Karst hydrology, *Groundwater, *Texas, Springs, Caves, Saline water, Discharge(Water), Sinks, Hydrogeology, Aquifers, *Permian(Texas), Evaporites.

Rocks of Upper Permian age in west Texas consist largely of red beds, but with interbedded gypsum and salt mostly in the lower part. Water moves downward from the overlying Ogallala formation into the Upper Permian to layers of gypsum; and then by solution and making caves, moves eastward and is discharged at the outcrop area of the gypsum. The vertical movement of the water is facilitated by the collapse of the underlying red beds into the caves. An estimated 10 million kilograms (10,000 tons) of chloride per day is discharged into the Arkansas, Red, and Brazoa Rivers. An understanding of the karst hydrology producing the salt water might be of importance to projects for alleviating the natural contamination. (See also W79-01932) (Humphreys-ISWS)
W79-01965

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
For primary bibliographic entry see Field 5B.
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5B.
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
For primary bibliographic entry see Field 5B.
W79-01969

GROUND WATER POLLUTION OF A LIMESTONE AQUIFER BY CAUSTIC WASTE,
Geological Survey of Jamica, Kingston. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-01970

EARLY CONFLICTS OVER EFFLUENT IRRIGATION IN MISSOURI'S OZARKS,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6E.
W79-01971

SUBSURFACE WATER BEHAVIOR AND SEWAGE EFFLUENT IRRIGATION IN THE MISSOURI OZARKS,
Missouri Univ., Columbia, School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W79-01972

INFLUENCE OF KARST ON ENGINEERING IN IRELAND,
Geological Survey of Ireland and Minerex, Ltd., Dublin.
For primary bibliographic entry see Field 8G.
W79-01973

CONSTRUCTION METHODS WHICH RECOGNIZE THE MECHANICS OF SINKHOLE DEVELOPMENT,
Reitz and Jens, Inc., St. Louis, MD.
For primary bibliographic entry see Field 8G.
W79-01974

THE EFFECTS OF HIGHWAY CONSTRUCTION ON THE HYDROGEOLOGIC ENVIRONMENT AT BOWDEN, WEST VIRGINIA,
Bowden National Fish Hatchery, WV.
For primary bibliographic entry see Field 5B.
W79-01975

RESULTS OF TRACING EXPERIMENTS FOR CONSTRUCTION OF RESERVOIRS IN KARSTIC REGIONS,
Technische Hochschule, Graz(Austria). Dept. of Hydrogeology.
For primary bibliographic entry see Field 8E.
W79-01976

USE OF THERMONICS IN FOUNDATION STUDIES IN KARSTIC TERRANE,
Hydrotechnics, Albuquerque, NM.
For primary bibliographic entry see Field 8E.
W79-01977

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W79-01992

2G. Water In Soils

TWO-DIMENSIONAL UNSTEADY WATER FLOW IN UNSATURATED POROUS MEDIA,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr.
In: Finite Elements in Water Resources, Edited by Gray, Pinder and Brebbia, Pentech Press, 1977, p. 3.3 - 3.19. 4 fig, 21 ref. (California Water Resources Center Project UCAL-WRC-W-336). OWRT-A-039-CAL(17).

Descriptors: *Finite element analysis, *Unsteady flow, *Groundwater, *Porous media, Unsaturated flow.

Two-dimensional unsteady water flow in unsaturated porous media is a common occurrence in groundwater flow. A finite element weighted residual iteration scheme is presented to solve this type of problem for the water content in the soil. The method presented is general and the results are compared with another published numerical solution to a similar example. The uniqueness of the solution and error estimates for the successive substitution scheme are presented to complete the analysis of the problem. (Snyder-Calif, Davis)
W79-01556

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr., and R. W. Lewis.
Journal of Heat Transfer, August 1975, p 467-469. 1 fig, 2 tab, 6 ref. (California Water Resources Center Projects UCAL-WRC-W-428) OWRT-A-039-CAL(13).

Descriptors: *Algorithms, *Least squares method, *Finite element analysis, Mathematical studies, Analytical techniques.

The least squares time-stepping algorith, which has previously been shown by the authors to be competitive for one-dimensional problems, is applied to the solution of several two-dimensional examples having constant material properties. The results are compared against answers obtained using recurrence relationships based on the finite element and finite difference methods. Analytical results for one of the examples are also used for comparison. The least squares algorithm proved to be more accurate for equal values of time step especially in the large time step cases. It, however, requires more computer time and storage than the other methods used. Several other limitations of the scheme are also presented. (Snyder-Calif, Davis)
W79-01557

A FINITE ELEMENT WEIGHTED RESIDUAL SOLUTION TO ONE-DIMENSIONAL FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, and G. Zyvoloski.
International Journal of Numerical Methods in Engineering, Vol. 6, 1973, p. 577-585. 2 fig, 7 tab, 9 ref. (California Water Resources Center Project, UCAL-WRC-W-336). OWRT-A-039-CAL(5).

Descriptors: *Finite difference method, Mathematical analysis, Numerical analysis, *Unsaturated flow, *Porous media, *Finite element analysis.

The one-dimensional diffusion-convection equation if formulated with the finite element representation employing the galerkin approach. A linear shape function and two-dimensional triangular and rectangular elements in space and time were used in solving the problem. The results are compared with finite difference solutions as well as the exact solution. As another example, the convection term is set equal to zero and these techniques are applied to the resulting heat equation and similar comparisons are made. (Snyder-Calif, Davis)
W79-01558

A FINITE ELEMENT SOLUTION TO A GENERAL TWO-DIMENSIONAL NONSYMMETRIC PARABOLIC PARTIAL DIFFERENTIAL EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, and G. Zyvoloski.
Computers and Fluids, Vol. 3, p. 217-224. 1975, 4 fig, 9 ref. (California Water Resources Center Project UCAL-WRC-W-336). OWRT A-039-CAL(11).

Descriptors: *Finite element analysis, *Mathematical studies, Analytical techniques, *Differential equations, *Galerkin method.

A general solution for a two-dimensional nonsymmetric parabolic partial differential equation is obtained using the Galerkin method in which the weighting function is taken equal to the shape function defining the dependent variable approximation. The solution domain was divided into finite elements having space-time coordinates. The solution technique was applied to the motion of dissolved constitutents in groundwater flow. The results are compared with the analytical and a finite-difference solution to the same problem. The finite element results compared extremely well with the analytical solution and did not display the numerical dispersion problems that occur in the finite difference solution. (Snyder-Calif, Davis)
W79-01559

FINITE ELEMENT SOLUTION OF TWO-DIMENSIONAL UNSTEADY AND UNSATURATED FLOW IN POROUS MEDIA.
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
G. Zyvoloski, and J. C. Bruch, Jr.
In: The Mathematics of Finite Elements and Applications II, edited by J.R. Whiteman, Academic Press, 1976, p. 299-307. 3 fig, 14 ref. (California Water Resources Center Project UCAL--WRC-W-336). OWRT A-039-CAL(16).

Descriptors: *Unsteady flow, *Groundwater, *Porous media, *Finite element analysis, Unsaturated flow.

A finite element weighted residual, successive substitution solution method is given for two-dimensional unsteady and unsaturated flows in porous media. For this type of flow problem, not only the governing differential equation, but also some of the boundary conditions are nonlinear. The technique presented is very general and easy to apply. Within each time step the solution subject to a fixed errors criterion which can be varied from step to step converges quite rapidly. As was seen the nonlinear heat conduction problem was a special case of the general mathematical model and theory. (Snyder-Calif, Davis)
W79-01560

THE USE OF NONIONIC SURFACTANTS ON SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. Letey.
In: Soil Conditioners, 1975, Soil Science Society of America, p 145-154. 5 fig, 1 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT B-141-CAL(12).

Descriptors: *Surfactants, *Soil water, *Wettability, Plant growth, Penetration, Surface tension, Absorption, *Infiltration rates, Application rates, Plant growth.

Nonionic surfactants lower the surface tension of water and are adsorbed by soil materials. Surfactants can be used to increase infiltration rates of water repellent soils but have not been demonstrated to be effective in increasing infiltration rates of wettable soils. Aggregate stability can be decreased, increased, and unaffected by nonionic surfactant treatment depending upon the surfactant application rate and nature of the soil being treated. Soil modulus of rupture can be decreased by very high surfactant application rates. Relatively low surfactant concentrations detrimentally affect plant growth in solution culture. Only extremely high application rates on soils detrimentally affect plant growth. Plants growing in water-repellent materials can be beneficially affected by surfactant application which improve the soil-water status for plants.
W79-01571

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
For primary bibliographic entry see Field 2H.
W79-01589

ALTERNATE DRYING AND REWETTING EFFECTS ON CHEMICAL AND PHYSICAL PROPERTIES AND MOISTURE-SALINITY RELATIONSHIPS OF A HISTOSOL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
M. Giskin, and I. Levin.
Agronomy Journal, Vol. 70, No. 3, p 445-447, May-June, 1978. 1 fig, 2 tab, 19 ref.

Descriptors: *Organic soils, *Drying, *Wetting, *Soil management, Soil chemical properties, Soil physical properties, Moisture content, *Electrical conductance, *Irrigation, *Histosols, *Saline soils, Salinity.

The purpose of the study was to investigate the possible influences on soil management of changes in chemical and physical properties resulting from a Histosol being carried through several successive dryings and wettings. Soil from the 0 to 30 cm layer of a low moor Histosol with a pH of 7.6 and organic matter content of 55.3% was used. Th soil was put through three successive cycle of ai drying and rewetting; subsamples were removed each stage and physical and chemical determin tions were carried out. The saturation percentag of the field sample decreased from 95.9 to 87.3 after the third drying cycle. The electrical condu tivity of the saturation extract decreased at eac drying stage, due to the large differences in th nitrate content between the dry and wet stages vs. 380 ppm). Moisture retention curve da showed a 5% difference in available water b tween the moist field sample and the same samp after air-drying. The data showed that laborator measurements of soil-water relations for a Histos change with time, i.e., with each exposure drying and rewetting prior to sampling. This info mation will have a direct bearing on the manag ment of a Histosol. (Skogerboe-Colorado Stat W79-01699

LINEARIZED MOISTURE FLOW WITH LOS AT THE SOIL SURFACE,
Arizona Univ. Tucson. Dept. of Soils, Water an Engineering.
D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Journal, Vol 4 No. 3 p 396-399, May-June, 1978. 2 fig, 8 re

Descriptors: *Soil water movement, Unsaturate flow, Evaporation, *Moisture content.

The general solution of a linearized moisture flo equation is derived for point and line source whether buried or on the soil surface. The surfac flux is taken to be proportional to the matric flu potential, which is consistent with the physic situation of small evaporative losses for dry so and larger losses for wet soil. The fraction of wate lost at the surface turns out to be identical for poi and line sources and for the steady-state case (m(2+m)) exponent (-alpha d) where m is th surface flux proportionality constant, d the dept of source, and alpha a constant from the assume unsaturated hydraulic conductivity function. Thi fraction is plotted as a function of time for a fixe source depth. Also given are curves depicting th total water loss as a function of source depth. generalized solution is derived for any type source located in a horizontal plane. (Skogerbo Colorado State)
W79-01704

NITRAPYRIN DEGRADATION AND MOVE MENT IN SOIL,
Georgia Univ., Experiment. Dept. of Agronomy
J. T. Touchton, R. G. Hoeft, and L. F. Welch.
Agronomy Journal, Vol. 70, No. 5, p 811-816 September-October, 1978. 5 fig, 5 tab, 13 ref.

Descriptors: *Nitrogen, *Nitrapyrin, *Nitrifica tion, Inhibitors, Degradation(Decomposition) *Ammonium compounds, Ammonia, *Fertilizers Soil chemical properties, Soil chemical properties Soil physical properties.

Nitrapyrin (2-chloro-6-(trichloromethyl) pyridine is applied with ammonium-N fertilizers to contro nitrification in soil. However, little information available on the the persistence or loss of field applied nitrapyrin. The objective of this study wa to monitor movement and degradation of nitra pyrin in soil. Nitrapyrin was applied with anhy drous ammonia in the fall of 1975 and spring o 1975 and 1976. Measurable quatities of nitrapyri were not found beyond 7.5 cm from the point o release in the soil. The instance that nitrapyri moved from the point of release in the soil was no affected by nitrapyrin rates. Greater nitrpyri movement was not detected in one direction from the point of release in the soil than in another direction. Increasing rates of anhydrous ammoni had no effect on nitrapyrin movement of degrada tion. The most rapid rate of degradation occurred soon after application and decreased with time The data suggest that nitrapyrin degradation and movement will depend on the physical and chemi cal characteristics of the soil. Even though degra dation rates decreased with time, no indication wa found to prove that soil accumulations of nitra

rin will result from once-a-year applications.
kogeboe-Colorado State)
79-01706

TILIZATION OF LABELLED UREA AND MMONIUM SULFATE BY LOWLAND RICE,
ouisiana State Univ., Baton Rouge. Dept. of gronomy.
or primary bibliographic entry see Field 2K.
79-01707

SSEMBLY FOR MOUNTING HYDRAULIC OIL CORE SAMPLER ON TRACTOR FRONT,
gricultural Research Service, Stoneville, MS.
or primary bibliographic entry see Field 7B.
79-01710

N ANALYSIS OF SENSIBLE AND LATENT EAT FLOW IN A PARTIALLY FROZEN UNATURATED SOIL,
'ashington State Univ., Pullman. Dept. of Agronny and Soils.
. Fuchs, G. S. Campbell, and R. I. Papendick.
oil Science Society of America Journal, Vol. 42, o. 3, p 379-385, May-June, 1978. 5 fig, 2 tab, 15 f, 2 append.

escriptors: *Frozen soils, *Heat flow, Freezing, hawing, Solutes, *Latent heat, Thermal conducvity.

heat flow theory has been developed which can e used to predict freezing and thawing cycles of a mperate soil. The latent heat of fusion is incorpoated into the classical heat flow equation with the eat capacity and the thermal conductivity of the oil modified to include terms which account for he phase transformation. Computations for a Pause silt loam soil show that the ice-liquid phase ansformation occurs over a defined temperature nge where the apparent heat capacity and the pparent thermal conductivity may take on values hich are several orders of magnitude larger than ose either in the unfrozen or in the near completely frozen soil. The computations also indicate at the presence of solutes in the soil water signifiantly lowers the temperature range over which he freeze-thaw zone develops and may allow conderable transport of water and heat at lower emperatures than in the absence of solutes. (Skoerboe-Colorado State)
V79-01711

ROP WATER REQUIREMENT IN RELATION O CLIMATE AND SOIL,
olcani Inst. of Agricultural Research, Bet-Dagan Israel). Inst. of Soils and Water.
. Shalhevet, and H. Bielorai.
oil Science, Vol. 125, No. 4, p 240-247, April, 978. 2 fig, 4 tab, 22 ref.

Descriptors: *Water requirements, Yield equation, Climatic data, *Soil properties, Cotton, Sorghum, Grapefruit, Evapotranspiration, Evaporation, Pans, Correlation analysis.

The effect of variation in climate and soil on the roduction function of water for the yield of otton, sorghum, and grapefruit was analyzed to etermine the transferability of water requirement nformation, accumulated in Israel, to other reions of the world. A model giving relative yield Y) as a linear function of relative evapotranspiraion (Et/Eo) for all climatic regions together was ompared with regional relationships of Y to net vater application. Y is the ratio of a treatment ield to the maximum yield obtained in an experiment; Et and EO are the cumulative seasonal evaotranspiration, including a small drainage compoent, and pan evaporation, respectively. The correation coefficients were high for field crops but maller for citrus. About 90 percent of the variabilty in yield of field crops were attributed to differnces in potential evapotranspiration and in irrigaion amounts. No effect was found of variations in oil on crop yield due to the rather uniform waterstorage capacity of soils of varying texture. It was roposed that the production functions obtained in Israel may be used in regions with similar climatic characteristics for a wide range of soils after accounting for climatic variations through pan evaporation estimates. (Skogerboe-Colorado State)
W79-01712

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-01713

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
U. Kafkafi, B. Bar-Yosef, and A. Hadas.
Soil Science, Vol. 125, No. 4, p 261-268, April, 1978. 1 fig, 2 tab, 43 ref, 3 append.

Descriptors: *Fertilization, *Computer models, Plant growth, Nitrates, Nitrogen, Phosphates, Potassium, Ammonium compounds, Nutrient removal, Root development, *Model studies, *Computer programs.

A fertilization decision model was suggested, based on soil and plant parameters. The optimum concentration range of nitrate nitrogen in the soil solution, during the uptake period of the growing plant, was suggested to be 50 to 250 ppm N-NO3 for all soils and plants. The optimum bicarbonate-soluble P was found to vary with plant and soil type, and was determined by response experiments. Percent recovery of added fertilizer by bicarbonate extraction was used to calculate the amount of fertilizer needed to raise the extraction value to the optimum level. Exchangeable potassium was considered to be the only source important during the growing season of an annual crop. The uptake rate of nutrients during the growing season, depth the root penetration, and sensitivity to ammonium were considered to be the main plant parameters. The model calculates, at present time intervals, the balance between the quantity of nutrients in the root zone and uptake by plants. A decision to add fertilizer is made if a deviation from the optimum exceeds a predetermined value. (Skogerboe-Colorado State)
W79-01714

FACTORS AFFECTING GYPSUM AND CATION EXCHANGE CAPACITY DETERMINATIONS IN GYPSIFEROUS SOILS,
American Univ., Beirut (Lebanon). Dept. of Soils and Irrigation.
For primary bibliographic entry see Field 2K.
W79-01716

EFFECT OF NITRAPYRIN ON NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Illinois Univ. at Urabana-Champaign. Dept. of Agronomy.
J. T. Touchton, R. G. Hoeft, and L. F. Welch.
Agronomy Journal, Vol 70, No 5, p 805-810, September-October, 1978. 5 fig, 5 tab, 15 ref.

Descriptors: *Nitrification, Inhibitors, Denitrification, *Nitrates, Fertilizers, *Ammonia fertilizers, Leaching, Timing, Rates of application, Soil types, *Nitrapyrin, *Nitrogen.

Nitrification of ammonium fertilizers in late fall and early spring and subsequent nitrate losses through leaching and denitrification are a continuing economical and environmental concern. To evaluate the effects of nitrapyrin on nitrification, anhydrous ammonia with and without nitrapyrin was applied in the fall and spring to poorly drained soils. Nitrogen and nitrapyrin rates ranged from 0 to 268 and 0 to 1.12 kg/ha, respectively. Detailed sampling from ammonia retention zones was conducted throughout the fall, spring, and summer. Effects of nitrapyrin on nitrification varied with time of application, nitrapyrin rate, and soil type. (Skogerboe-Colorado State)
W79-01717

A METHOD OF PROMOTING PENETRATION OF WATER INTO TIGHT, SLOPING SOIL UNDER DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 3F.
W79-01719

DETERMINATION OF STABILITY CONSTANTS OF METAL-HUMIC ACID COMPLEXES BY POTENTIOMETRIC TITRATION AND ION-SELECTIVE ELECTRODES,
National Inst. for Environmental Studies, Yatabe (Japan). Water and Soil Environment Div.
For primary bibliographic entry see Field 5A.
W79-01721

THE STATISTICAL MECHANICAL THEORY OF WATER TRANSPORT THROUGH UNSATURATED SOIL. 1. THE CONSERVATION LAWS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Water Resources Research, Vol. 14, No. 3, p 474-478, June 1978. 26 ref. OWRT B-046-ARIZ(8), NSF ENG76-0921.

Descriptors: *Soil water movement, *Theoretical analysis, *Statistical models, *Unsaturated flow, Equations, Statistical methods, Mass, Momentum equation, Continuity equation, Mathematical models, Model studies, *Statistical mechanics, Macroscopic balance equations.

The macroscopic differential equations of mass and momentum balance for water in a rigid unsaturated soil were derived from first principles by using the methods of statistical mechanics. The derivation begins with the development, at the molecular level, of expressions for the mass and linear momentum densities of water in a soil. The derivatives of these expressions with respect to the time then provide for local balance equations that are ensemble averaged and local volume averaged in order to produce the macroscopic balance equations. The resulting macroscopic equations agreed with those derived for mass and linear momentum transport in a soil on the basis of the continuum theory of mixtures. The unified insight into mass transport processes afforded by a statistical mechanical theory as compared to one evolved from a solely macorscopic view was discussed. (See also W79-01725) (Visoky-ISWS)
W79-01724

THE STATISTICAL MECHANICAL THEORY OF WATER TRANSPORT THROUGH UNSATURATED SOIL. 2. DERIVATION OF THE BUCKINGHAM-DARCY FLUX LAW,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Water Resources Research, Vol. 14, No. 3, p 479-484, June 1978. 18 ref. ENG76-09210.

Descriptors: *Soil water movement, *Theoretical analysis, *Statistical models, *Unsaturated flow, Equations, Hydraulic conductivity, Statistical methods, Hydraulic gradient, Mathematical studies, Buckingham-Darcy flux law, Experiments, Linear response theory.

The Buckingham-Darcy flux law, an empirical equation that relates the volumetric flux density of water in an unsaturated soil to the gradient of the total potential, was derived from first principles by using the methods of statistical mechanics. The derivation given, a direct application of well-known techniques in nonequilibrium statistical mechanics, proceeds through a detailed molecular description of two laboratory experiments for measuring the hydraulic conductivity tensor of a homogeneous unsaturated soil. In the first experi-

ment, the steady flow of water is induced by a gradient in the matric potential; while in the second, flow is induced by a gradient in the gravitational potential. In both cases, the appropriate form of the Buckingham-Darcy law was derived on the basis of a linear response approximation, and an expression for the hydraulic conductivity was given in terms of a time integral of the correlation function for the velocities of the water molecules in the soil. The problem of calculating the hydraulic conductivity of soil thereby was reduced to quadrature and to the task of developing a molecular model of the velocity correlation among the water molecules. A recent successful model of this type was discussed briefly. (See also W79-01724) (Visocky-ISWS)
W79-01725

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W79-01729

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-01738

PROFILE MODIFICATION OF A FRAGIUDALF TO INCREASE CROP PRODUCTION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 3F.
W79-01740

RELATIONSHIP BETWEEN SOIL TEST AND SMALL GRAIN RESPONSE TO P FERTILIZATION IN FIELD EXPERIMENTS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 3F.
W79-01786

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
H. M. Selim.
Soil Science, Vol. 126, No. 3, p 127-135, September, 1978. 10 fig, 14 ref.

Descriptors: *Solutes, *Unsaturated flow, *Soil water movement, *Mass transfer, Mathematical models, Numerical analysis, Equations, Infiltration, Adsorption, Chemical reactions, Unsteady flow, Model studies, Multilayered soils, Redistribution.

A numerical model was developed to predict water and reactive solute transport through water-unsaturated, mulitlayered soils. An explicit-implicit finite difference approximation method was used to solve the water and solute transport equations simultaneously. Calculated results were presented for two- and three-layered soils during water infiltration and redistribution. Linear and nonlinear equilibrium adsorption, first-order kinetic reaction, and irrversible kinetic reaction were used to describe solute adsorption in individual soil layers. It was found that, for all adsorption mechanisms considered, concentration distributions during infiltration and redistribution was influenced significantly by the order in which the soil layers were stratified. (Visocky-ISWS)
W79-01921

2H. Lakes

'THERMAL POLLUTION' OF BODIES OF WATER AND THE HYDROLOGIC ASPECTS OF THE PROBLEM,
For primary bibliographic entry see Field 5B.
W79-01505

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
R. C. Reynolds, and N. M. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 675, Price codes: A02 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No. 5, October 1974. 19 p, 5 fig, 1 tab, 4 ref. NSF GI-34839.

Descriptors: *Geochemistry, *Water chemistry, *Utah, Calcium carbonate, Water quality, Chemical analysis, Chemical properties, Water analysis, Turbidity, Convection, Circulation, Mixing, Inorganic compounds, Water circulation, Currents(Water), Analysis, Thermal stratification, *Major element geochemistry, *Lake Powell(Utah), *Environmental impact assessment.

Chemical studies of Lake Powell indicated that its waters are moderately saline and that their composition is controlled by the relative proportions of contributions from the Green, San Juan, and Colorado Rivers. Ionic species are present in the proportions SO4 more than Ca similar to Na more than Alkalinity more than Mg more than Cl much more than K. Surface waters are oversaturated with respect to calcium carbonate, and salt flux calculations and comparisons of pre-and post-dam bicarbonate concentrations of river water at Lee's Ferry suggested precipitation of calcium carbonate in Lake Powell. Physical studies of the lake showed that it can be classified as warm monomictic; but it possesses meromictic tendencies inasmuch as convective mixing to the bottom does not occur. Despite the lack of deep convective mixing, the bottom waters have not become anaerobic because they are replaced periodically by cold, saline, advective flows from the input at Hite. The lake still possesses much of the character of a river reach in which the water has a long residence time. (Henley-ISWS)
W79-01511

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

SUMMARY REPORT OF THE PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Central Div.
For primary bibliographic entry see Field 4A.
W79-01528

GREAT LAKES SHORELINE DAMAGE SURVEY, SAINT LOUIS COUNTY, MINNESOTA, APPENDIX I.
Arrowhead Regional Development Commission, Duluth, MN.
For primary bibliographic entry see Field 4A.
W79-01529

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 4A.
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01531

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD INVESTIGATION OF HIGH WATER DAMAGE IN OSWEGO COUNTY, NEW YORK, APPENDIX IV,
Saint Lawrence-Eastern Ontario Commission, Watertown, NY.
For primary bibliographic entry see Field 4A.
W79-01532

MEASUREMENT OF COASTAL BLUFF RECESSION FROM AERIAL PHOTOGRAPHS, MUSKEGON COUNTY, MICHIGAN, APPENDIX VII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01534

EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2K.
W79-01550

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 6G.
W79-01555

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
H. I. Snider, M. Gable, and R. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 241, Price codes: A02 in paper copy, A01 in microfiche. Institute of Water Resources University of Connecticut, Starrs, Project Completion Report March 1978. 13 p. 5 tab, 4 ref. OWRT A-068-CONN(1), 14-31-0001-3507.

Descriptors: *Chemistry of lakes, *Land use, Soils, Lake basins, Eutrophication, Water pollution effects, *Zoning, *Drainage basin analysis(Lakes), *Connecticut, Lakes, Planning models.

Land use, soils, and lake water chemistry were studied in 12 lake drainage basins in stern Connecticut. Housing and agriculture are the most prevalent uses of land in the lake watersheds; However, the percentage of use varies substantially. Soil studies were based on Natural Soils Groups which also varied from basin to basin. In general, the most adaptable land for urban development has been the first used for residential subdivision. Further residential intensification, especially on hardpan soils, could become a major factor in eutrophication acceleration and water pollution. The relationship of land use and soils to water chemistry is complex and must consider regional differences in waters prior to examination for change. Eastern Connecticut lakes are mostly soft ad extremely soft

ith respect to bicarbonate content. Specific conductivities of lake water range from 34 to 154.4, ith a mean median of 62f micromhos/cm. for 76 kes sampled. An approximation of total dissolved lids in p.p.m. or mg/1 can be made by multiplyg specific conductance by 0.63. Major cation and ion dominance vary. 'Original' water dominated calcium and bicarbonate ions has been changed ainly by addition of sodium and chloride ions. 79-01589

PRELIMINARY ECOLOGICAL SURVEY OF ARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
rkansas Water Resources Research Center, Fayteville.
or primary bibliographic entry see Field 6G.
79-01591

UTRIENT CYCLING AND PRODUCTIVITY F DYSTROPHIC LAKE-BOG SYSTEMS PART A), APPENDIX A: IN SITU EXPERIENTS ON THE DISSOLVED AND COLLOIAL STATE OF IRON IN AN ACID BOG AKE,
lichigan Univ., Ann Arbor. School of Natural esources.
or primary bibliographic entry see Field 5C.
79-01597

UTRIENT CYCLING AND PRODUCTIVITY F DYSTROPHIC LAKE-BOG SYSTEMS PART A) APPENDIX B: THE INFLUENCE OF OLLOIDAL ORGANIC MATTER (COM) PON IRON AND IRON-PHOSPHORUS CYLING IN AN ACID BOG LAKE,
lichigan Univ., Ann Arbor. School of Natural esources.
or primary bibliographic entry see Field 5C.
79-01598

ISTRIBUTION AND PRODUCTION OF AGO PONDWEED (POTAMOGETON PECINATUS L.) ON A NORTHERN PRAIRIE IARSH,
elta Waterfowl Research Station, Portage la rairie (Manitoba).
or primary bibliographic entry see Field 2I.
79-01629

VETLANDS OF THE UNITED STATES: THEIR XTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
ish and Wildlife Service, Washington, DC. Div. f Ecological Services.
or primary bibliographic entry see Field 6B.
79-01635

NVENTORY OF WETLAND HABITAT USING EMOTE SENSING FOR THE PROPOSED AHE IRRIGATION UNIT IN EASTERN ORTH DAKOTA
outh Dakota State Univ., Brookings. Remote ensing Inst.
or primary bibliographic entry see Field 3F.
79-01636

APPLICATION OF LANDSAT IMAGE WETLAND STUDY AND LAND CLASSIFICATION N WEST TENNESSEE,
ennessee University Space Inst. Tullahoma. emote Sensing Div.
or primary bibliographic entry see Field 7B.
79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WETLANDS IN WEST TENNESSEE,
ennessee Univ., Knoxville.
or primary bibliographic entry see Field 7B.
79-01639

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 7B.
W79-01642

WETLAND PLANT COMMUNITIES ALONG THE EASTERN SHORELINE OF LAKE ONTARIO,
State Univ. of New York at Syracuse. Dept. of Forest Botany.
For primary bibliographic entry see Field 2I.
W79-01644

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES 3. LAKE REREWHAKAIITU,
Auckland Univ. (New Zealand). Dept. of Botany.
V. J. Chapman, and J. Clayton.
Hydrobiologia, Vol. 47, No. 3-4, p 399-413, December 1, 1975. 3 fig, 1 ref.

Descriptors: *Submerged plants, *Lakes, *Survey, Rooted aquatic plants, Wetlands, Eutrophication, Light penetration, Plant morphology, Lake Rerewhakaiitu(New Zealand).

The submerged and emergent aquatic macrophyte vegetation of the eutrophic Lake Rerewhakaiitu was surveyed in February-March 1973, and is described qualitatively. At the time the lowered lake level had resulted in producing a sward of normally submerged aquatics as land forms. The principal dominant in the sward is Myriophyllum propinquun, the plants being greatly reduced in length to short stems with single entire leaves. At the uppermost levels Tillaea sinclairii is a significant component of the sward, and at lower levels Lilaeopsis lacustris behaves similarly. Below the uppermost submerged belt of macrophytes there is a characean meadow of Chara fibrosa and C. australis which in deeper waters gives way to Potamogeton ochreatus with either C. australis or Nitella hookeri. The high degree of eutrophication and consequent low light penetration has resulted in a vegetation limit at 4-5-5m, which is lower than that found in other Rotorua lakes. (See also W73-13711 and W73-06489) (Stihler-Mass)
W79-01652

DESIGN WAVE INFORMATION FOR THE GREAT LAKES; REPORT 5, LAKE SUPERIOR,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-01662

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W79-01666

ZOOBENTHOS IN THERMAL DISCHARGE TO WESTERN LAKE ERIE,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5C.
W79-01675

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5C.
W79-01697

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 6B.
W79-01845

COMPUTING EVAPORATION FOR INLAND WATER BODIES UNDER A VARIETY OF FETCH AND ATMOSPHERIC STABILITY CONDITIONS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W79-01895

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATIONAL AREA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01900

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

LAKE SHORE PROTECTION AGAINST WIND-GENERATED WAVES,
Illinois State Water Survey, Urbana. Hydrology Section.
N. G. Bhowmik.
Water Resources Bulletin, Vol. 14, No. 5, p 1064-1079, October 1978. 8 fig, 1 tab, 17 ref.

Descriptors: *Illinois, *Bank stabilization, *Shores, *Lakes, Erosion, Design, Boating, Filters, Gravels, Riprap, Lake shores, Waves(Water), Winds, Hydrology, Hydraulics, *Lake shore protection, Riprap particles.

A method was reported for estimating the height of wind waves in any lake for a given wind condition. Maximum wind speeds from 5 climatological stations in and around Illinois for the period of 1950-1972 were analyzed, and the maximum wind speed for various durations and return periods were presented. Statistical analysis of wind wave data collected from Carlyle Lake indicated that Rayleigh distribution fitted the wave height distribution reasonably well and that the nondimensional energy spectra followed the (f/f sub m) to the minus 5th power rule in the equilibrium range of frequencies. From a consideration of various forces and physical properties of riprap particles and water, a relationship was developed to estimate the stable weight of riprap particles. Practical design criteria wee proposed to stabilize lake shores against wind waves. (Lee-ISWS)
W79-01917

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-01984

AN UNOBTRUSIVE MEASURE OF THE RECREATIONAL VALUE OF A LAKE,
Augusta Coll., GA.
For primary bibliographic entry see Field 6B.
W79-01986

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-01988

THE EFFECTS OF ADVECTION-DIFFUSION PROCESSES ON THE EUTROPHICATION OF LARGE LAKES, A HYPOTHETICAL EXAMPLE: LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W79-01993

A STUDY OF PARAMETER ESTIMATION PROCEDURES OF A MODEL FOR LAKE PHOSPHORUS DYNAMICS,
Wiezmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5C.
W79-01994

2I. Water In Plants

UPTAKE AND TRANSLOCATION OF A NONIONIC SURFACTANT BY BARLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
N. Valoras, J. Letey, and J. Osborn.
Agronomy Journal, Vol. 66, May-June 1974, p. 436-438. 6 fig, 1 tab, 7 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT-B-141-CAL(10) and B-072-CAL(12).

Descriptors: *Wetting agents, Water repellency, Radioactive assays, *Surfactants(Nonionic), *Barley, *Absorption, *Plant growth.

Experiments were conducted to determine if nonionic surfactants are taken up and translocated by plants growing in solution or soil containing the surfactant. The effect of surfactant on plant growth was concurrently determined. Barley (Hordeum vulgare L.) and the surfactant 14C-labeled Soil Penetrant 3685 were used in the study. Surfactant concentrations in solution ranged from 0 to 300 ppm, and the amount of 14C-labeled surfactant measured in plant shoots increased as the solution concentration increased. There was also a decrease in plant growth as surfactant concentration application increased. Soils were wet with solutions containing 0 to 10,000 ppm surfactant. Surfactant was taken up and translocated from soil systems, but much higher concentrations had to be applied to the soil as compared to solution culture for equal uptake and/or plant damage. Highest concentrations of surfactant occurred in the older leaves and in the tip portion as compared to the base portion of the leaf. Increased plant damage appeared to be associated with increased surfactant concentration in the plant tissue, but a direct cause-and-effect relation could not be established from the study. (Snyder-Calif, Davis)
W79-01563

NONIONIC SURFACTANT EFFECTS ON GROWTH AND POROSITY OF BARLEY ROOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
R. J. Luxmoore, N. Valoras, and J. Letey.
Agronomy Journal, Vol. 65, Sept.-Oct. 1974, p. 673-675. 2 tab, 12 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT B-141-CAL(11).

Descriptors: *Water repellency, *Surfactants, *Intercellular spaces, Porosity, *Root, *Barley, Growth rates.

Nonionic surfactant materials were applied in both solution and soil culture to assess the direct surfactant and the soil-surfactant interaction effects on root dry weight and root porosity (gas space volume per unit root volume) of barley (Hordeum vulgare L.). Plants were grown for 28 days in solution culture with nonionic surfactant Soil Penetrant 3685 up to 100 ppm. Root dry weight was significantly reduced at 40 ppm and was further reduced to 32% of control plant root weight at 100 ppm. Root porosity, determined by the pycnometer method decreased from 13% (control) to 9% with 20 to 80 ppm surfactant. At 100 ppm, porosity was 4.5%. These results suggest that surfactant penetrated the root at concentrations above 20 ppm and caused flooding of intercellular gas spaces. At a high concentrations above 20 ppm and caused flooding of intercellular gas spaces. At a high concentration (> 40 ppm) root growth decreased and the surfactant inhibited root tip meristematic processes. Soil Penetrant was more toxic to roots than water in surfactant and this more toxic than Aqua Gro surfactant in a soil having little water repellency. Adsorption of surfactants by soil reduced the toxicity to roots. In a water repellent soil, root growth at 28 days was greatly enhanced with a 5,000 ppm addition of either Aqua Gro or Water In indicating more favorable soil-plant water relations. In both soils root dry weight was reduced at high surfactant concentration, however, there were no significant effects on root porosity (mean value 5.7%) suggesting that root tip physiology was more affected by surfactants than internal root morphology. (Snyder-Calif, Davis)
W79-01564

THE USE OF NONIONIC SURFACTANTS ON SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W79-01571

DISTRIBUTION AND PRODUCTION OF SAGO PONDWEED (POTAMOGETON PECTINATUS L.) ON A NORTHERN PRAIRIE MARSH,
Delta Waterfowl Research Station, Portage la Prairie (Manitoba).
M. G. Anderson.
Ecology, Vol. 59, No. 1, p 154-160, Winter, 1978. 1 fig, 2 tab, 54 ref.

Descriptors: *Pondweeds, *Potamogeton species, *Ecological distribution, *Standing crops, Soils, Soil texture, Marshes, Phosphorus, Potassium, Fresh water marshes, Rooted aquatic plants, Delta Marsh(Manitoba), Canada, Lake Manitoba.

Physical and chemical parameters of soils and water, measured on 140 sites in the Delta Marsh, Manitoba between May 1973 and September 1974, were compared with presence and dry-weight standing crop of sago pondweed (Potamogeton pectinatus L.) on those sites. Mean comparisons and discriminant function analyses identified water depth, soil texture and maximum and directional exposure to wave action as important variable affecting plant distribution. Multiple regression analyses suggested that water depth, available soil K, available soil P, soil texture and directional exposure, were important factors affecting growth on colonized sites. A greenhouse experiment demonstrated that sago pondweed grew better on Delta Marsh soils that normally supported the plant, suggesting that some specific edaphic adaptations might exist. Within the euphotic zone of the Delta Marsh, sago pondweed distribution was probably most affected by predvailing winds through their influence on soil distribution and turbulence. (Stihler-Mass)
W79-01629

THE PRODUCTION OF PULP FROM MARSH GRASS.
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 4A.
W79-01630

THE SALT MARSH FLORA OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius, and S. McDaniel.
Castanea, Vol. 43, No. 2, p 86-95, June, 1978. 1 tab, 28 ref.

Descriptors: *Mississippi, *Salt marshes, *Aquatic plants, *Rooted aquatic plants, Ecological distribution, Marshes, Coastal marshes, Tidal marshes, Wetlands.

Vascular plants found in the tidal marshes of Mississippi were collected over an eight-year period with an intense investigation from 1973 to 1976. A list of plants totalling 173 species, representing 53 families, is presented. The general distribution of each species is indicated as being one or a combination of the following: fresh water but occasional low salinity due to inundation by tidal waters, brackish water, saline water, and hypersaline water. (Stihler-Mass)
W79-01632

PREGERMINATION REQUIREMENTS AND ESTABLISHMENT TECHNIQUES FOR SALT MARSH PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
P. K. Falco, and F. J. Cali.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 514, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper D-77-1, 1977. 23 p, 1 fig, 7 tab, 32 ref, 1 append.

Descriptors: *Salt marshes, Marsh plants, *Spoil banks, *Vegetation establishment, *Planting management, Wetlands, Marshes, Halophytes, Coastal engineering, Excavation, Dredging, Grasses, Marsh management, Soil types, Soil properties, Elevation, Salt marsh establishment, Dredge spoil salt marsh, Spartina alterniflora.

Both seeding and transplating have resulted in successful artificial marsh establishment on natural coastal areas and on deposited dredged materials. Establishment appears to be independent of substrate, but long-term growth and survival of salt marsh grasses apparently are dependent upon substrate. Growth regulation appears to be associated with soil physical factors such as percolation, diffusion, drainage, and aeration rather than with the chemical characteristics of the soil. Elevation and hydraulics, which largely determine the periodicity of plat submergence and emergence, appear to control plat distribution and zonation. Since momentum transport is also largely determined by elevation and hydraulics, establishment and growth of salt marsh plants are affected by the bed sheer stress of the substrate. Biological, mechanical, and engineering problems associated with artificial marsh establishment are discussed. Consideration of these problems and the rapid process of natural invasion and colonization of salt marsh plants on properly elevated dredged materials has resulted in the conclusion that emphasis should be placed on the development of equipment and techniques to allow fine control of dredged material elevation. (Steiner-Mass)
W79-01641

WETLAND PLANT COMMUNITIES ALONG THE EASTERN SHORELINE OF LAKE ONTARIO,
State Univ. of New York at Syracuse. Dept. of Forest Botany.
B. A. Gilman.
M.S. Thesis, SUNY College of Environmental Science and Forestry. April 1976. 187 p, 37 fig, 20 tab, 119 ref.

Descriptors: *Wetlands, *Primary productivity, *Distribution patterns, *Lake Ontario, Marsh plants, Biological communities, Ecological distribution, Environmental gradient, Nutrients, Competition, Productivity, Stratification, Campbell Marsh(New York), Black Pond(New York), Vegetational zoning.

Ponded and streamside wetland systems along the eastern shoreline of Lake Ontario have compositional similarities but distinctive productivity, diversity, and zonation patterns. Long-term compositional changes in ponded and streamside wetland systems occur in response to changes in the environmental complex, especially those involving water regime, nutrient enrichment, and the introduction of competitive species. Short-term changes are more readily interpretated as a response to disturbance and are often temporary. Physiognomic zonation is evident among wetland communi-

ties but compositional zonation is present only among steep environmental gradients. Net annual primary production increases as substrate nutrient supply increases, providing the improvement has not resulted from disturbance like detrital movements. A negative relationship exists between net annual primary productivity and diversity suggesting that increases in community complexity comes at the expense of lower primary production. Possible mechanisms that might account for this consistent relationship include temporal spacing of species productivities in the more diverse communities, vegetative stratification, and the role of woody individuals. (Steiner-Mass)
W79-01644

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES 3. LAKE RERWHAKAIITU,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-01652

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-055 106, Price codes: A05 in paper copy, A01 in microfiche. Technical Report Y-78-4, April 1978. 95 p, 3 append, 13 fig, 62 ref. Prepared in Environmental Laboratory, USAEWES.

Descriptors: *Wetlands, *Plant populations, *Vegetation, *West Coast states(US).

This guide to the major plant associations and communities found in wetlands within the West Coast States is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U.S. Army Engineer Districts for use in wetland identification in the implementation of Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The classification system in the guide is intended solely for use in the Section 404 permit program and is not considered a classification system for other purposes. (WES)
W79-01665

RESPONSES OF STOMATA AND WATER, OSMOTIC, AND TURGOR POTENTIALS OF JOJOBA TO WATER AND SALT STRESS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 3C.
W79-01909

TEMPERATURE DEPENDENCE OF WATER UPTAKE BY PLANT ROOTS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
F. N. Dalton, and W. R. Gardner.
Agronomy Journal, Vol. 70, No. 3, p 404-406, May-June, 1978. 4 fig, 1 tab, 11 ref.

Descriptors: *Moisture uptake, *Root systems, *Temperature, Solutes, Kinetics, Diffusivity, *Absorption.

The Transport of water through root membranes is described in terms of equations which couple water and solute transport. The solute transport equatin includes active as well as passive uptake. Temperature effects are manifested in the viscosity of water, the osmotic permeability coefficient of the membranes, and the rate constant for the active solute uptake. From standard reaction rate kinetics, reasonable estimates of of the termperature coefficients of these three processes can be made. A genral equation for the effect of temperature on the uptake rate for a given driving force is derived. This difference in flux between live and dead roots is adequately described by the model, indicating the significance of the active component of the uptake process. (Skogerboe-Colorado State)
W79-01910

2J. Erosion and Sedimentation

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W79-01519

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 4D.
W79-01523

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
For primary bibliographic entry see Field 2K.
W79-01551

SOURCES OF HEAVY METALS IN SEDIMENTS OF THE HUDSON RIVER ESTUARY,
Lamong-Doherty Geological Observatory, Pallisades, NY.
For primary bibliographic entry see Field 5B.
W79-01678

PARTIAL AREA RESPONSE ON SMALL SEMIARID WATERSHEDS,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W79-01916

LAKE SHORE PROTECTION AGAINST WIND-GENERATED WAVES,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 2H.
W79-01917

FLUVIAL ADJUSTMENTS TO THE SPREAD OF TAMARISK IN THE COLORADO PLATEAU REGION,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Geological Society of America Bulletin, Vol. 89, No. 10, p 1491-1501, October 1978. 13 fig, 4 tab, 42 ref.

Descriptors: *Shrubs, *Colorado, *Tamarisk, Fluvial sediments, Sedimentation, Flooding, Turbulence, Friction, Islands, Sand bars, Vegetation effects.

Tamarisk, a shrub or low tree that was artificially introduced into the American Southwest in the late 1800's, has spread throughout the Colorado Plateau region by occupying islands, sand bars, and beaches along streams. Historical photographs show that tamarisk spread from northern Arizona to the upper reaches of the Colorado and Green Rivers at a rate of about 20 km/yr. Detailed studies on the Green River in Canyonlands National Park, Utah, showed that the plant has trapped and stabilized sediment, causing an average reduction in channel width of 27%. Photogrammetric analysis of historical ground photography, including photos from John Wesley Powell's 1871 expedition, and recent aerial photographs supplemented by field surveys provided quantitative data. Expanded islands and channel-side bars exhibit allometric relationships as they change, apparently maintaining a balance between turbulence and friction. Overbank flooding is common on the tamarisk-stabilized features. (Lee-ISWS)
W79-01919

SEASONAL VARIATION IN BEACH EROSION AND SEDIMENTATION ON THE OREGON COAST,
Williams Coll., Williamstown, MA. Dept. of Geology.
W. T. Fox, and R. A. Davis, Jr.
Geological Society of America Bulletin, Vol. 89, No. 10, p 1541-1549, October 1978. 13 fig, 1 tab, 23 ref.

Descriptors: *Beach erosion, *Sedimentation, *Oregon, *Seasonal, Waves(Water), Sands, Winter, Summer, Winds, Climates, *Beach profiles, Summer upwelling season, Winter storm season, Barometric pressure.

A study of the relationship between climate and beach erosion was conducted on the Oregon coast from June 1973 through May 1974. The climatic year on the Oregon coast can be divided into 2 major seasons, the summer upwelling season, extending from early April through late September; and the winter storm season, from October through March. The summer upwelling season, dominated by the North Pacific high, is characterized by north winds, coastal upwelling, frequent fog, and low waves. The winter storm season is marked by strong winds, heavy rain, and high waves. During the upwelling season, north winds were 0 to 15 m/s, and waves were 1 to 3 m high. Two sets of sand bars formed in the intertidal zne, advanced up the beach at 1 to 5 m/day, and expanded to the south at 5 to 15 m/day. Topographic maps of the beach and intertidal zone were surveyed at low spring tides at South Beach, Oregon. There was a net deposition of 15,100 cu m of sand on the beach from July 4 through August 12, 1973. In the winter storm season, the wind shifted to the southwest, increased to 22 m/s, and waves reached more than 5 m in height. Sand was stripped from the beach by longshore currents and backwash from waves during storms and returned to the beach in large bars between storms. The total volume of sand involved in the exchange was about 54,000 cu m or 110 cu m per linear meter of beach. (Lee-ISWS)
W79-01920

PHYSICAL, CHEMICAL, AND MINERALOGICAL PROPERTIES OF FLUVIAL UNCONSOLIDATED BOTTOM SEDIMENTS IN NORTHWESTERN OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
G. J. Wall, L. P. Wilding, and N. E. Smeck.
Journal of Environmental Quality, Vol 7, No 3, p 319-325, 1978. 5 fig, 5 tab, 16 ref.

Descriptors: *Bottom sediments, *Physical properties, *Chemical properties, *Mineralogy, *Ohio, *Water quality, Sediments, Clays, Heavy metals, Water pollution sources, Suspended load, Pollutants, Soil erosion, Unconsolidated sediments, Analytical techniques, *Clay mineralogy, *Sediment origin, *Heavy metal enrichment, *Mineralogical properties, *Maumee River(Ohio), Suspended sediment.

Fluvial unconsolidated bottom sediments that have the potential to become part of the suspended sediment load in the Maumee River Basin, Ohio, range in texture from sandy loams to clays. Particle size analysis by water dispersion and electrolyte dispersion procedures revealed that an average of 34% of the total clay fraction was aggregated into the silt and sand-sized range, indicating that the coarser fraction of bottom sediments may be physically-chemically active. The 2- to 50-micrometer fraction was dominated by quartz with secondary amounts of mica, kaolinite, feldspars, and carbonates. Mean calcite, dolomite, and calcium carbonate equivalent values were 4.1, 3.4, and 7.8%, respectively. Calcite dissolution in transport is probable on the basis of observed calcite-dolomite ratios. Organic matter content of the fluvial bottom sediments (3 to 7%) was analogous to Lake Erie bottom sediments and Maumee River suspended sediments. CEC values ranged from 39 to

55 meq/100 g for the total clay fraction collected by electrolyte and water dispersion procedures. Enrichment of heavy metals of bottom sediments over surficial soil materials occurred for Cu, Ni, Zn, Ca and Pb by factors of 1.6, 2.0, 2.3, 3.5, and 3.0, respectively. Traces of herbicides (atrazine, 2-4-D) and insecticides (DDT metabolites, endosulfan) were detected in the filtered stream water samples and bottom sediment materials. Downstream trends in selected physical, chemical, and mineralogical properties could not be related to increased urban influences or increased stream discharge. (Henley-ISWS)
W79-01926

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-01984

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

2K. Chemical Processes

PROBLEMS IN AUTOMATING THE MONITORING OF SURFACE WATER CHEMISTRY,
Hydrochemical Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W79-01507

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W79-01511

THE ADSORPTION OF CHROMIUM (VI) AT THE OXIDE/WATER INTERFACE,
Air Force Civil Engineering Center, Kirtland AFB, NM.
For primary bibliographic entry see Field 5B.
W79-01514

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5A.
W79-01517

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-01535

EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
R. R. Weiler.
J Fish Res Board Can. 31(3), p 329-332, 1974.

Descriptors: *Atmosphere, Canada, *Carbon dioxide, Di, Exchange, *Lake Ontario, Primary production, Storm, Winter, Air-water interfaces.

The calculated flux of CO2 between Lake Ontario (USA, Canada) and the atmosphere ranged from about 0.1 gC m-2 day-1 during the summer to about 3 during a winter storm. During the summer, the amount of C supplied from the atmosphere was from 5-30% of the estimated amount utilized in primary production. Also Lyman's dissociation constants for carbonic acid were found applicable to the carbonate system of the lake.--Copyright 1974, Biological Abstracts, Inc.
W79-01550

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
F. T. Manheim.
Clays and Clay Minerals, Vol 22, p 337-343, 1974. 2 fig, 3 tab, 36 ref.

Descriptors: *Connate water, *Sediments, *Oceans, Methodology, Chemical analysis, Analytical techniques, Evaluation, Sampling, Core drilling, Subsurface waters, Water types, Pore water, Sea water, *Deep sea core drilling.

The implication by Murthy and Ferrell (1972) that interstitial water studies are in a confused state is critized on the basis that the authors have not drawn on a considerable body of data, especially Soviet studies since the 1950's, and results of the Deep Sea Drilling Project. Pressure filtration systems for extracting interstitial waters are currently the methods of choice for marine studies and have achieved substantial reliability and reproducibility. Although gaps and problems remain, many aspects of interstitial composition of marine sediments have been clarified; these include the substantial constancy of composition of interstitial waters in deep sea pelagic deposits, depletion of interstitial cations owing to authigenic mineral formation in more rapidly accumulated (especially terrigenous) sediments, and special phenomena in sediments overlying salt deposits. (Woodard-USGS)
W79-01551

TRICKLE-BED REACTOR PERFORMANCE, PART 1: HOLDUP AND MASS TRANSFER EFFECTS,
California Univ., Davis. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-01565

TRICKLE-BED REACTOR PERFORMANCE, PART II: REACTION STUDIES,
California Univ., Davis. Dept. o
For primary bibliographic entry see Field 5D.
W79-01566

MASS TRANSFER IN PACKED BEDS WITH TWO-PHASE FLOW,
California Univ., Davis. Dept. of Chemical Engineering.
S. Goto, J. Levec, and J. M. Smith.
Industrial Engineering Chemistry Process Design and Development, Volume 14, No. 4, 1975, p 473-478. 10 fig, 1 tab, 16 ref. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(4).

Descriptors: *Mass transfer, *Flow rates, Coefficients, *Trickle beds, *Two-phase flow, Liquid flow rates, Gas flow rates, *Gas-to-liquid mass transfer.

Mass transfer coefficients were measured at 25C and 1 atm for concurrent liquid (water) and gas flow in beds of small particles (0.054-0.29 cm) of napthalene and CuO-ZnO. The coefficients for transfer between particle and liquid are not greatly different for the three arrangements: upflow, downflow (trickle bed), or liquid full. At high gas rates and low liquid rates upflow gives somewhat higher transport rates, while trickle beds are favored over liquid-full operation at high liquid rates. Desorption of oxygen was measured to obtain liquid-to-gas coefficients when mass transfer in the liquid phase controlled interphase transport. For downflow such coefficients were independent of gas flow rate, but in upflow liquid-to-gas coefficients increased with gas rate. Upflow gave higher coefficients at high gas and liquid rates. Desorption of napthalene from water to air was employed to evaluate the gas-side coefficient in liquid-to-gas transfer for trickle-bed operation. The results showed a high sensitivity to gas flow rate and a modest sensitivity to liquid rate. (Snyder-Calif, Davis)
W79-01567

MEASUREMENT OF TOTAL ORGANIC CONCENTRATION IN WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 5A.
W79-01600

UTILIZATION OF LABELLED UREA AND AMMONIUM SULFATE BY LOWLAND RICE,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
K. R. Reddy, and W. H. Patrick, Jr.
Soil Science Society of America Journal, Vol. 42, No. 3, p 465-467, May-June, 1978. 4 tab, 4 ref.

Descriptors: Stable isotopes, *Ureas, *Ammonium compounds, Nitrogen, Fertilizers, Fertilization, *Rice, Flood irrigation.

The objective of this investigation was to compare labelled ammonium sulfate and urea in their effect on yield and N utilization in field microplots on Crowley silt loam (typic albaqualf). Nitrogen was applied as an early season topdressing or as a midseason topdressing and the grain and straw yield and recovery of labelled and native N in the grain straw, and soil were measured. No significant differences in grain and straw yields were observed for the two sources and two times of N application. Ammonium sulfate and urea did not differ significantly in N utilization by the crop. For both sources the recovery of labelled N in the soil-plant system was highest (34 to 55 kg N/ha) in the plots receiving early season topdressing (30 to 38 kg N/ha). More native soil N was taken up by the plants during 1976 as compared to the 1975 season. (Skogerboe-Colorado State)
W79-01707

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
G. Kruh, J. Hagin, and S. Sharon.
Soil Science, Vol. 125, No. 4, p 255-260, April, 1978. 3 fig, 2 tab, 19 ref.

Descriptors: Fertilization, Computer models, *Simulation analysis, *Cotton, Ammonium compounds, *Nitrates, Soil moisture, Crop response, Timing, *Fertilizers, Model studies.

In a field experiment on cotton, ammonium sulfate was applied to give 60, 120, and 180 kg N/ha, all in winter, early spring, and late spring applications. A check treatment was included. Soil samples to a depth of 120 cm were taken from time to time, and moisture and nitrate concentrations were meas-

ed. The early spring fertilization at the two ver levels of application produced higher yields n the two other application times. With a maxi- m at the 120-kg N/ha level. The highest level of plication induced a yield depression. The early ing application produced a nitrate distribution the soil profile with a peak in the 20-40 cm pth. The yield results were partially explained the nitrate distribution in the soil profile during early growth period. A computer program ulated well, within experimental errors, the ni- te distribution in the soil profile. It was conclud- that such a program could improve consider- y nitrogen fertilizer requirements and timing dictions. (Skogerboe-Colorado State)
79-01713

CTORS AFFECTING GYPSUM AND TION EXCHANGE CAPACITY DETERMI- ATIONS IN GYPSIFEROUS SOILS,
erican Univ., Beirut (Lebanon). Dept. of Soils l Irrigation.
H. Sayegh, N. A. Khan, P. Khan, and J. Ryan.
l Science, Vol. 125, No. 5, p 294-300, May, 78. 4 fig, 15 ref.

scriptors: *Cation exchange, *Gypsum, Cal- m, Magnesium, Sodium compounds, Ammoni- compounds, Soil profiles, Particle size, ls(Gypsiferous).

ofiles of gypsiferous soils from the Euphrates in of Iraq and Syria were studied. Increasing eness of grinding, from 10, 50, 100, and 170 to -mesh, increased the measured amounts of sum and soluble Ca + Mg. These variables increased as the soil:water ratio increased i.e., 0, 1:100, and 1:500. Cation exchange capacity ues at 10, 100, and 270-mesh sizes were deter- ed by various procedures: 1N NaOAC/ H4OAC solutions prepared with distilled water with 1:1 water-acetone mixture; pretreatments the soil with 2N BaCl2.2H2O, saturated 2C2O4, and saturated (COOH)2.2H2O by shak- for variable periods up to six days. After each treatment, CEC was determined by the conven- nal NaOAC/NH4OAC procedure. Highest ues were obtained after pretreatment, the order ng Na2C2O4, BaCl2.2H2O, and OOH)2.2H2O. Values increased with time of king during pretreatment and with increasing eness of particle size. Criteria are presented for ermining gypsum and CEC in soils containing nificant amounts of gypsum. (Skogerboe-Colo- o State)
79-01716

TERMINATION OF STABILITY CON- ANTS OF METAL-HUMIC ACID COM- EXES BY POTENTIOMETRIC TITRATION D ION-SELECTIVE ELECTRODES,
tional Inst. for Environmental Studies, Yatabe pan). Water and Soil Environment Div.
r primary bibliographic entry see Field 5A.
79-01721

LAR PHOTOLYSIS OF WATER,
A. Frosch, and P. R. Ryason.
S. Patent No. 4,105,517, 7 p, 3 fig, 1 tab, 2 ref; ficial Gazette of the United States Patent Office, l 973, No 2, p 727, August 8, 1978.

scriptors: *Patents, *Wate properties, *Chemi- properties, Hydrogen, Oxygen, Solar radiation, otolysis, *Photo-oxidation reaction.

cyclic process for the solar photolysis of water ludes a first stage in which water is reduced in presence of a Eu+2 photo-oxidizable reagent ducing hydrogen and spent oxidized Ru+3 rea- t. The spent reagent (Eu+3) is reduced by ans of a transition metal ligand complex reduc- t, *RuL+3 in a photoexcited state, such as a henium pyridyl complex. Due to competing re- ons between the photolysis and regeneration ducts, the photo-oxidation reaction must be arated from the regeneration in space and time supporting the reagent and/or the reductant on d support and utilizing pH, wavelength and flow control to maximize hydrogen and oxygen production. (Sinha-OEIS)
W79-01883

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W79-01897

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 2G.
W79-01921

DEVELOPMENT OF A NEW TECHNIQUE FOR THE ANALYSIS OF PESTICIDES IN WATER,
Kentucky Water Resources Research, Inst., Lexington.
For primary bibliographic entry see Field 5A.
W79-01981

2L. Estuaries

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 4A.
W79-01510

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W79-01518

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W79-01519

THREE-DIMENSIONAL FLOW SIMULATION IN ESTUARIES,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S-K. Liu.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 100, Price codes: A02 in paper copy, A01 in microfiche. June 1975. 14 p, 8 fig, 5 ref.

Descriptors: *Model studies, *Estuaries, *Chesapeake Bay, *Flow, Mathematical models, Fluid mechanics, Analytical techniques, Numerical analysis, Currents(Water), Velocity, Diffusion, Equations, Tides, Tidal effects, Water temperature, Finite element analysis, Heat balance, Salt balance, Salinity, Three-dimensional flow.

The described model was based upon numerical integration of the flow equations which simulate the water movements caused by tides, wind, and pressure differences, and upon numerical integration of the advective diffusion equation representing the movements of salt and temperature. The model neglects vertical accelerations, but not vertical velocities, and includes an approximation for the sub-gridscale effects by introduction of mass and momentum exchange coefficients. These coefficients are dependent upon the Richardson number and vertical velocity gradients. The computation method was tested on an estuary, and the results of the simulations were presented in graph form. The three-dimensional flows in estuaries with nonisotropic density distributions can be computed effectively according to the finite difference method described. The model requires coefficients used in describing the small-scale mass and momentum exchanges. These coefficients must be found experimentally from field data. (Humphreys-ISWS)
W79-01524

FLOATING BREAKWATERS: AN IDEA WHOSE TIME HAS RETURNED,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W79-01525

FLOATING BREAKWATER FIELD ASSESSMENT PROGRAM, FRIDAY HARBOR, WASHINGTON,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W79-01526

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
For primary bibliographic entry see Field 2K.
W79-01551

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
For primary bibliographic entry see Field 6E.
W79-01631

THE SALT MARSH FLORA OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2I.
W79-01632

TECHNIQUES FOR SAMPLING SALT MARSH BENTHOS AND BURROWS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W79-01634

USE OF LANDSAT DATA TO RELATE WATER DEPTH TO OBSERVED AREA OF INUNDATION IN COASTAL MARSHES,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 7B.
W79-01637

PREGERMINATION REQUIREMENTS AND ESTABLISHMENT TECHNIQUES FOR SALT MARSH PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 2I.
W79-01641

COMBINED TEMPERATURE-SALINITY EFFECTS ON GRASS SHRIMP,
California Univ., Davis. Dept. of Land, Air and Water.
For primary bibliographic entry see Field 5C.
W79-01645

PRESERVING THE HERITAGE OF GASPARILLA ISLAND, AN APPROACH TO CONSERVATION OF THE ECONOMIC, CULTURAL,

HISTORICAL, AND NATURAL RESOURCES OF THE ISLAND,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-01646

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
For primary bibliographic entry see Field 6B.
W79-01648

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4C.
W79-01651

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01659

NUMERICAL SIMULATION OF TIDAL HYDRODYNAMICS, GREAT EGG HARBOR AND CORSON INLETS, NEW JERSEY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. L. Butler.
Technical Report H-78-11, June 1978. 138 p, 5 append, 76 fig, 5 tab, 15 ref.

Descriptors: *Inlets(Waterways), *New Jersey, *Tidal hydrodynamics, *Navigation channels, *Great Egg Harbor, Inlet(NJ), *Corson Inlet(NJ), *Numerical simulation.

Great Egg harbor Inlet and Corson Inlet, located in southeast New Jersey, have been plagued with hazardous navigation conditions and erosion problems. Numerical techniques were used to investigate the tidal hydrodynamics of the inlet complexes for existing conditions and for proposed improvement plans. Physical size and complex geometry of the study areas required a simulation model that could be economically applied. Consequently, and inherent part of the study involved development of a numerical model (WI model) based on an implicit finite difference formulation. The model includes treatment of moving boundaries and subgrid-scale barriers. A comparison study with a well-known explicit finite diference tidal model was performed to assure the implicit model's reliability and cost effectiveness. The WI model was then applied to Great Egg Harbor and Corson Inlets to quantitatively predict the tidal hydrodynamics (exclusive of salt and sediment transport) for existing conditions and various improvement plans. Results indicate the systems proposed for Corson Inlet appear to function equally well and no detrimental effects were noted. For Great Egg Harbor Inlet, a concentration of ebb flow toward the upcoast deposition basin and structure was noted, suggesting a potential problem which should be recognized for the proposed plans. (WES)
W79-01661

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-01665

LEAD ACCUMULATION RATES IN TISSUES OF THE ESTUARINE TELEOST FISH, GILLICHTHYS MIRABILIS: SALINITY AND TEMPERATURE EFFECTS,
Scripps Inst. of Oceanography, La Jolla, CA
For primary bibliographic entry see Field 5C.
W79-01667

STREPTOCOCCUS SP. FROM MARINE FISHES ALONG THE ALABAMA AND NORTHWEST FLORIDA COAST OF THE GULF OF MEXICO,
Auburn Univ., AL. International Center for Aquecultures.
For primary bibliographic entry see Field 5C.
W79-01698

STUDIES ON THE MYTILUS EDULIS COMMUNITY IN ALAMITOS BAY, CALIFORNIA: VII. THE INFLUENCE OF WATER-SOLUBLE PETROLEUM HYDROCARBONS ON BYSSAL THREAD FORMATION,
California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01701

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-01750

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
For primary bibliographic entry see Field 5C.
W79-01811

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, .Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01818

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01822

RECONNAISSANCE OF THE INTERTIDAL AND SHALLOW SUBTIDAL BIOTIC LOWER COOK INLET,
Dames and Moore, Homer, AK.
For primary bibliographic entry see Field 5C.
W79-01824

APPLICATIONS OF MIXING EXPERIMENTS TO ESTUARIES,
Johns Hopkins Univ., Baltimore, MD.
R. R. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 221, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the Speciality Conference on 'Civil Engineering in the Oceans/III,' American Society of Civil Engineers, June 9-12, 1975, University of Delaware, Newark, p 1400-1419. 6 fig, 28 ref. ONR N00014-75-C-0805.

Descriptors: *Estuaries, *Mixing, *Mathematical models, *Froude number, *Saline water-freshwater interfaces, Salinity, Critical flow, Tidal waters, Fjords, Density stratification, Model studies, Two-layer models, Richardson number.

The paper first considered estuarine circulations i deep, two-layer, fjord-type estuaries, ignoring th details of the mass distribution and the circulation in the main body of the estuary and concentratin on the flow conditions and interface depth in th vicinity of the mouth. The flow near the mout was considered to be frictionless and the pressur hydrostatic, and the first part of the analysis a sumed strong mixing. Phenomena in this state ar functions of a non-dimensional number Q sub proportional to the freshwater influx. On the othe hand, the problem is also solvable when the mixin is zero. The two extreme cases suggest a simpl dependence on a mixing number M for arbitrar mixing. This permits a complete solution for th ocean water flux, brackish water flux, depth of th interface at the mouth, salinity of the brackis water, depth of the halocline in the main body o the estuary, and height above sea level of the fre surface in the estuary, all as functions of Q sub and M. The second part of the paper presented complete solution for flow conditions and mas distributions in a deep, two-layer rectangular est ary. Mixing occurs across the interface, and fri tion is a dominant factor. The interface slope downward toward the mouth, reaching a max mum depth at a certain section. Beyond this, th interface rises. At the mouth, where by definitio the width of the estuary increases rapidly, it wa found that there must be a transition from subcrit cal to supercritical flow. The solution is dete mined by the freshwater influx per unit width, th turbulent velocity, the estuary length, and th buoyancy of seawater. (Adams-ISWS)
W79-01911

ON THE EXCITATION OF EDGE WAVES ON BEACHES,
California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.
A. A. Minzoni, and G. B. Whitman.
Available from the National Technical Informatio Service, Springfield, VA 22161 as ADA-040 52 Price codes: A02 in paper copy, A01 in microfich Report No. 39, June 1977. 15 p, 3 tab, 11 ref, append. Reprint from Journal of Fluid Mechanics Vol. 79, Part 2, p 273-287, 1977. ONR N00014-75 C-0702.

Descriptors: *Waves(Water), *Ocean wave *Beaches, *Model studies, Mathematical models Equations, Mathematics, Theoretical analysis Shores, Coasts, Edge waves, Nonlinear waves.

The excitation of standing edge waves of frequen cy 1/2 omega by a normally incident wave train o frequency omega was discussed previously on th basis of shallow water theory. In this paper, th problem was formulated in the full water wav theory without making the shallow water approxi mation and solved for beach angles Beta=pi/2N where N is an integer. The work confirmed th shallow water results in the limit N much greathe than 1, showed the effect of larger beach angles and allowed a more complete discussion of som aspects of the problem. (Sims-ISWS)
W79-01914

SEASONAL VARIATION IN BEACH EROSION AND SEDIMENTATION ON THE OREGON COAST,
Williams Coll., Williamstown, MA. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W79-01920

MICROSTRUCTURE OF AGGLOMERATED SUSPENDED SEDIMENTS IN NORTHERN CHESAPEAKE BAY ESTUARY,
South Carolina Univ., Columbia. Dept. of Geology.
C. F. Zabawa.
Science, Vol. 202, p 49-51, October 6, 1978. 3 fig 39 ref.

Descriptors: *Sediment, *Suspended load, *Turbi dity, *Chesapeake Bay, Sedimentary petrology Mineralogy, Coagulation, Flocculation, Electro

mistry, Plankton, Benthic fauna, Estuaries, Mi-structure, Pelletization.

pended sediments in the turbidity maximum of esapeake Bay include composite particles which tain platy mineral grains, arranged both in pel- (attributable to fecal pelletization) and in net-rks of angular configuration (attributable to ctrochemical flocculation and coagulation). (Vi-ky-ISWS)
9-01923

FECTS OF NUTRIENT ENRICHMENT OF A LT MARSH ON DIATOM COMMUNITIES,
ssissippi State Univ., Mississippi State. Water sources Research Inst.
primary bibliographic entry see Field 5C.
9-01982

VE FORCES ON CAUSEWAY-TYPE ASTAL BRIDGES,
ssissippi State Univ., Mississippi State. Dept. of il Engineering.
primary bibliographic entry see Field 8B.
9-01983

RINE ALGAL VEGETATION IN SHALLOW TER AROUND THE DANISH ISLAND OF LTHOLM, THE SOUND,
titut for Sporeplanter, Copenhagen(Denmark).
primary bibliographic entry see Field 5C.
9-01996

TROUS OXIDE IN THE OXYGEN MINI-UM OF THE EASTERN TROPICAL NORTH CIFIC: EVIDENCE FOR ITS CONSUMP-ON DURING DENITRIFICATION AND POS-BLE MECHANISMS FOR ITS PRODUC-ON,
egon State Univ., Corvallis. School of Oceanog-hy.
primary bibliographic entry see Field 5C.
9-01997

WATER SUPPLY AUGMENTATION AND CONSERVATION

A. Saline Water Conversion

RAMETRIC STUDY AND PRELIMINARY ALUATION OF REVERSE OSMOSIS FOR AWATER DESALINATION,
k Ridge National Lab., TN.
Glueckstern, S. A. Reed, and J. V. Wilson.
ailable from the National Technical Information rvice, Springfield, VA 22161 as ORNL-TM-1, Price codes: A04 in paper copy, A01 in crofiche. Report No. ORNL/TM-5231, Novem- 1976. 54 p, 9 fig, 9 tab, 11 ref, 3 append. W-5-eng-26.

scriptors: *Desalination, *Reverse osmosis, omputer models, *Optimization, Flash distilla-n, Costs, Comparative costs, Sea water, Eco-mics, Computer programs, Membrane processes, ltistage flash distillation, Costs, Comparative sts, Treatment, Operating costs.

sults of a parametric study are presented of one- d two-stage reverse osmosis for (RO) systems alination of sea water are presented. Optimiz-on of RO systems was approached using a re-tly developed computer program which ap-ed membrane manufacturers' performance data d predicted costs. Based on these data and other uipment and operating costs, a preliminary eval-ion of the economics of reverse osmosis for sea ter desalination was made. Plant capacities in range of 1 Mgd were considered and compared onomically with the current most common mul-age flash (MSF) distillation process at different ergy price levels. It was concluded that reverse nosis desalination plants are competitive with SF plants in the 1-Mgd range and, if projected technology is realized, in the 2.5-Mgd range. However, it is evident that reverse osmosis cannot compete with dual purpose MSF plants. (Majtenyi-IPA)
W79-01580

WATER REQUIREMENTS AND DESALTING IN THE UNITED STATES OF AMERICA,
M. V. Hughes, Jr.
Desalination, Vol. 21, p 301-307, 1977. 9 fig, 1 tab, 8 ref. Based on a talk presented February 23, 1977. the Technology Transfer Conference, Desalting State-of-the Art Review, Reston, VA.

Descriptors: *Desalination, *Water resources, *Water utilization, *Water requirements, *Projections, Data, Irrigation, Recycling, Water pollution control, Water quality, Water demand, Water reuse, Planning, Brackish water, Desalination plants, Water sources.

The impact of U.S. water requirements on the need for desalination is discussed using data from preliminary figures of the 1975 Water Assessment of the Water Resources Council. A great potential for increases in desalination is predicted because of the large and increasing water requirements for industrial, municipal, and energy uses. Principal locations of U.S. desalination plants and their capacities are tabulated and the type of usage in relation to capacity is expressed graphically. Irrigation is discussed in detail because it is the largest consumer of water with about 80% of the 1975 consumption. In addition, increased salinity due to irrigation return flows places additional burdens on water resources. Increases in industrial consumption and higher standards for treating waste water indicate that desalination will be used increasingly in the future. The reuse of water and turning to brackish and ocean water to supplement scarce local supplies of fresh water will require additional desalination facilities. (Majtenyi-IPA)
W79-01582

FORWARD OSMOSIS EXTRACTORS: THEORY, FEASIBILITY AND DESIGN OPTIMIZATION,
Arizona Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody.
Available from National Technical Information Service, Springfield, VA, 22161 as PB-289 251, Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 135 p, 18 fig, 6 tab, 52 ref, 6 append. OWRT B-053-ARIZ(4), 14-34-0001-7137.

Descriptors: *Osmosis, *Desalination, *Membrane processes, Separation, Cost analysis, Concentration polarization, Reclamation, Agriculture, Irrigation, Greenhouses, *Optimization, *Forward osmosis.

Osmosis occurs when two solutions of differing osmolar concentrations are separated by a membrane permeable to the solvent but not to the solutes. In osmosis, water flows spontaneously from the low concentration source solution to the high concentration driving solution. Forward osmosis is examined as a low-technology, low-energy use processes for hydration and dehydration of aqueous solutions. The fundamental mechanical device is a continuous counterflow extractor which incorporates a semipermeable membrane separating the source and driving solutions. The counterflow design permits maximum water recovery from the source solution and maximum dilution of the driving solution. The nonlinear differential equations describing the water and solute flows in the extractor are solved using analytical and numerical techniques. The resulting mathematical models contain design equations which can be used to determine the optimum membrane transport charcteristics, optimum membrane size, and the asymmetric membrane orientation which minimizes concentration polarization. Theoretical and experimental results compare well. Two applications discussed in detail are the production of potable water from seawater using human nutrients, and fertilizer-driven forward osmosis (FDF) for converting saline water to irrigation water.
W79-01592

MUNICIPAL WATER SUPPLY SYSTEM,
J. L. Rugh, II.
U.S. Patent No. 4,102,752, 4 p, 1 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1604, July 25, 1978.

Descriptors: *Patents, *Desalination, *Desalination plants, *Potable water, Domestic water, Water purification, Water treatment, Nuclear reactors, Nuclear powerplants, Temperature.

A municipal water supply system provides potable water under pressure from seawater and includes a nuclear reactor heated boiler for raising the temperature of sea to at least 250F and at superatmospheric pressure. The superheated steam is conveyed to an expansion turbine where the steam drives a turbine while the temperature of the steam is reduced to about the boiling point of water at atmospheric pressure. A heat exchanger condenses the exhaust from the turbine while simultaneously preheating incoming sea water to the system. Liquid pumping means driven by the expansion turbine for conveying the condensed water under pressure to a municipal distribution are provided. Additionally, are provided for controlling the temperature within the boiler chamber by controlling the volume of incoming sea water. (Sinha-OEIS)
W79-01863

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 8G.
W79-01887

3B. Water Yield Improvement

DEVELOPMENT AND EVALUATION OF IMPROVED FILMS FOR SUPPRESSING WATER EVAPORATION,
Arizona State Univ., Tempe. Dept. of Chemical Engineering.
C. O. Reiser, and T. J. Ruhoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 230, Price codes: A02 in paper copy, A01 in microfiche. University of Arizona, Tucson, Water Resources Research Center, Project Completion Report, July 1978. 15 p, 5 fig, 1 tab, 9 ref, append. OWRT A-061-ARIZ(1). 14-31-0001-5003.

Descriptors: *Evaporation control, Wave suppression, *Monomolecular films, Chemical films, *Water conservation.

A small water-wind tunnel with an air passage 0.24 m high by 0.22 m wide and 6.5 m long over a water layer 7 cm deep has been used for the dynamic testing of surface films for evaporation control. Differences in the entering and exit humidity were determined at air speeds up to 11 m/sec when feeding water suspensions of resistant films at the tunnel entrance. At the conditions used, long-chain alcohol films with 16 to 20 carbons mixed with 10% of a C18 monoethoxylate gave about 50% evaporation reduction and were about twice as effective as multilayer films containing linoleic acid polymerized with polyvinyl alcohol. Wave dampening above 11 m/sec (24.5 mi/hr) is difficult and no significant difference in wave suppression was observed between these two types. Further investigations using this equipment, which models natural conditions, are needed to develop more wind-resistant films in an effort to commercialize a promising method of water conservation.
W79-01537

REDUCING PHREATOPHYTE TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. C. Davenport, and R. M. Hagan.
In: Hydrology and Water Resources in Arizona

and the Southwest, Vol. 6, April-May, 1976, p. 141-146. 2 fig, 4 tab, 6 ref. OWRT C-6030-(No. 5325) (2).

Descriptors: *Antitranspirants, *Transpirants, *Riparian water loss, Tamarisk, Cottonwoods, *Phreatophytes, *Transpiration rates, Plant transpiration, Water conservation, Water yield improvement.

Transpiration rates (T) of riparian phreatophytes can be high. Antitranspirant (AT) sprays can curtail T without ecological imbalance made by eradication. Saltcedar (Tamarix sp.) and cottonwood (Populus sp) in 15-gal. drums enabled replicated trials on isolated plants or on canopy. T for a unit ground area of saltcedar varied from 2.2 (sparse-) to 15.8 (dense-stand) mm/day in July at Davis. Extrapolation of experimental T data to field sites must, therefore, be made carefully. Wax-based ATs increased foliar diffusive resistance (R), and reduced T of slatcedar and cottonwood 32-28% initially and 10% after 3 weeks. R increased naturally in the afternoon when evaporative demand was high and if soil water was low. Nocturnal T of salt cedar was 10% of day T. AT effectiveness increased with a higher ratio of day: night hours, and with lower soil water stress. Therefore, AT will be most effective on long summer days in riperian areas where ground water is available. (Snyder-Calif, Davis)
W79-01562

A NONDESTRUCTIVE APPROACH TO REDUCING RIPARIAN TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. C. Davenport.
In: Riparian Forests in California, Their Ecology and Conservation Institute of Ecology, University of California, Davis Publication No. 15, May 14, 1977, p 103-110. 1 fig, 1 tab, 39 ref. OWRT C-6030(No. 5235)(3).

Descriptors: *Riparian plants, *Riparian land, *Transpiration, *Antitranspirants, Plant transpiration, Phreatophytes, Water conservation, Water yield improvement.

The continuous availability of ground water to riparian phreatophytic vegetation results in large transpiration losses to the atmosphere. These are most significant in summer when high transpiration rates coincide with peak demands for ground- and stream-water. While complete eradication of riperian vegetation can increase stream flow, it can also cause undesirable physical (e.g., erosion) and ecological (e.g., to wildlife) disturbances. On the other hand, spraying a non-destructive antitranspirant (e.g., a wax-based emulsion) on riparian vegetation can reduce transpiration, by over 50% in lab. tests and 30% in field tests, with no phytotoxicity. This alternative to eradication is being tested as a means of improving ground and surface-water supplies with minimum risk of environmental damage. (Snyder-Calif, Davis)
W79-01586

METHOD AND MEANS OF TREATING WATER WELLS,
Moran (Thomas L.), Amarillo, TX. (Assignee).
D. M. Paul.
U.S. Patent No. 4,103,743, 6 p, 3 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 141, August 1, 1978.

Descriptors: *Patents, *Water wells, *Water sources, *Water yield improvement, Water supply, Combustion, Acids, Artificial recharge, *Water pollution treatment.

A method and means for chemically treating water wells to increase the production is described. Liquid chemical, usually acid, is initially placed in the well through the water discharge conduit of the well head or pump apparatus. Compressed air is initially forced into the interior of the column pipe in the casing to sense the depth of the water so that pressure sensitive gauges in the circuitry may be set according to the water depth. Compressed air is then forced into the column pipe to force some of the water into the water bearing formation. A combustible mixture of air and gas is then introduced into the upper end of the column pipe and ignited so that the force of combustion expels the water and acid in the casing through the slits in the well casing into the water bearing formation. The heated bases of combustion cool rapidly and the combustion step is repeated approximately 200-300 times over a period of approximately three hours. The heat of combustion increases the temperature of the water and acid to approximately 108F which enhances the action of the acid. The impact of combustion also tends to loosen or break any encrustation which is present in the water bearing formation. The well is then pumped for approximately 2 to 3 hours to remove the acid and residue. (Sinha-OEIS)
W79-01871

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W79-01992

3C. Use Of Water Of Impaired Quality

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

INVESTMENT PLANNING FOR COLORADO RIVER SALINITY CONTROL,
California Univ., Los Angeles. Graduate School of Management; and California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W79-01587

ALTERNATE DRYING AND REWETTING EFFECTS ON CHEMICAL AND PHYSICAL PROPERTIES AND MOISTURE-SALINITY RELATIONSHIPS OF A HISTOSOL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W79-01699

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan.
R. J. Hanks, T. E. Sullivan, and V. E. Hunsaker.
Soil Science Society of America Journal, Vol. 41, No. 3, p 606-610, May-June 1977. 5 fig, 6 tab, 9 ref. OWRT C-5189(No. 4233)(1), B-121-UTAH(1).

Descriptors: *Corn(Field), *Crop response, *Salinity, Soil moisture, *Irrigation effects, Evapotranspiration, *Crop production, *Alfalfa.

Yields of corn and alfalfa were determined where both salinity and water stress were imposed. Yields of corn at Logan, Utah in 1975 were decreased by salinity or water stress (caused by low irrigation levels) in direct relation to the decrease in evapotranspiration. The decrease in evapotranspiration was caused by a decrease in soil water depletion, indicating that salinity influenced soil water availability. Corn yields at Vernal, Utah in 1974 were decreased by salinity, but to a considerably lesser extent by low irrigation, probably because of water flow upward into the root zone from a water table. Alfalfa yields at Vernal in 1974 were not decreased by salinity or by low irrigation rates, because of water supplied by a water table and used by roots below the zone of salinity. (Skogerboe-Colorado State)
W79-01734

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-01735

EVALUATION OF NITRAPYRIN AS A MEANS OF IMPROVING N EFFICIENCY IN IRRIGATED SANDS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W79-01847

TESTING SALT TOLERANCE VARIABILITY AMONG TALL WHEATGRASS LINES,
Agricultural Reseach Service, Riverside, CA. Salinity Lab.
M. C. Shannon.
Agronomy Journal, Vol. 70, No. 5, p 719-722, September-October, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Wheatgrasses, *Salt tolerance, Varieties, Variability, *Plant breeding, Plant physiology.

In the present study a screening procedure was evaluated to determine its usefulness in detecting variation among introductions of tall wheatgrass (Agropyron elongatum (Host) Beauv). In greenhouse sand flats, 32 lines of tall wheatgrass were established and subjected to stepwise increases in sainity up to 765 meq/liter or until severe lead damage resulted. The lines were classified into five groups based on relative leaf damage and recovery rates from salt treatment. Repeating the screening procedure of seven each of the most tolerant and most sensitive lines reaffirmed the results of the first screening. Mineral analyses indicated that tolerance was associated with restricted accumulation of Na, Ca, and Cl in the shoots. Proline and soluble sugars contributed to osmotic adjustment at high salinities, but sensitive and tolerant lines did not differ in proline content. This screening technique appeared to discriminate between lines with different ion transport properties and different salt tolerances. The sensitivie and tolerant lines identified may be beneficial in future breeding and physiological studies. (Skogerboe-Colorado State)
W79-01879

RESPONSES OF STOMATA AND WATER, OSMOTIC, AND TURGOR POTENTIALS OF JOJOBA TO WATER AND SALT STRESS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
J. A. Adams, F. T. Bingham, M. R. Kaufmann, G. J. Hoffman, and D. M. Yermanos.
Agronomy Journal, Vol. 70, No. 3, p 381-387, May-June, 1978. 4 fig, 2 tab, 42 ref.

Descriptors: *Desert plants, Soil-water-plant relationships, *Salt tolerance, *Drought tolerance, *Turgidity, Transpiration, *Stomata, Xylem, *Jojoba.

Jojoba (Simmondsia chinensis (Link) Schneider) is a desert shrub which can provide a much needed substitute for sperm whale oil. Because of the absence of soil-plant-water data for jojoba and the limited amount of such information for desert plants in general, selected plants were water-and-salt-stressed in greenhouse soil and sand culture experiments. Responses of leaf water, osmotic, and turgor potentials to stress and associated stomatal behavior were studied. (Skogerboe-Colorado State)
W79-01909

3D. Conservation In Domestic and Municipal Use

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural

conomics.
or primary bibliographic entry see Field 5D.
79-01544

LAND STUDY FOR DOWNTOWN LAKE HARLES,
ouston Univ., TX. Coll. of Architecture.
r primary bibliographic entry see Field 6B.
79-01838

NOVATIVE MANAGEMENT CONCEPT OR 208 PLANNING,
chigan Univ., Ann Arbor. Civil Engineering d Natural Resources.
r primary bibliographic entry see Field 5G.
79-01848

STEMATIC DEVELOPMENT OF INSTITUONAL AND LEGAL PRESCRIPTIONS FOR RBAN WATER USE AND MANAGEMENT,
rdue Univ., Lafayette, IN. Water Resources Research Center.
r primary bibliographic entry see Field 6E.
79-01891

ATER CONSERVATION IN THE LAS VEGAS LLEY: PRICING AND ALTERNATIVE EASURES,
vada Univ. System, Reno. Water Resources nter.
K. Lyon.
ailable from the National Technical Information vice, Springfield, VA 22161 as PB-289 373, ce codes: A03 in paper copy, A01 in microfiche. olication No. 41056, 1978; 33 p. 1 fig, 8 tab, 52 OWRT A-085-NEV(1), 14-34-0001-8030.

scriptors: Water demand, Water resources, ater costs, *Economics, *Water conservation, icing, *Nevada, *Las Vegas Valley(Nev), *Alnative costs, Alternative water use, recasting(Population), *Metering.

onomic literature on water conservation is rewed. Two methods appear to be most promis- metering and pricing. Marginal versus average t pricing is discussed. Pricing analysis is applied he study area, Las Vegas Valley, NV. Several ulation forecasts are used to estimate future er demand. Unless population grows at the hest anticipated rate, present water supplies uld be sufficient to the year 2000. The role of rgy in supplying water in the Las Vegas Valley lso discussed. Price of water will be affected as rgy prices increase and become a large percent- of the total cost of water. Consumer response ncrease in price of water is usually to decrease sumption, thereby postponing, at least for a rt while, the need for new water supplies for area. A policy of water conservation will also lt in energy conservation. Areas in need of her research are outlined.
9-01896

E ROLES OF WATER CONSERVATION LUES IN COMMUNITY POLICY,
orado State Univ., Fort Collins.
V. Snodgrass.
ilable from the National Technical Information vice, Springfield, VA 22161 as PB-289 608, e codes: A10 in paper copy, A01 in microfiche. Thesis, 1977, 205 p, 15 fig, 21 tab, 83 ref. RT A-030-COLO(2).

criptors: *Cities, *Planning, *Water supply, nservation, *Water conservation, Direct reuse, er consumption, *Community development, lorado, Louisville(Colo), Lafayette(Colo).

ploying a Q-Sort Factor Analytical Design, this y sought to develop a system for parametric esentation of nonlinear data structures using acquired from representative samples of entire munities. The representations are specified in ns of a spatial metric 'social space', an analogue sychological space. The defined social space is characterized and used to define the community action zone which is hypothesized to a zone of community acceptance for those policies falling within its bounds. Such a zone for the communities of Lafayette and Louisville, Colorado was used to define socially and politically feasible water conservation policies for the communities. Policies with the highest feasibility for acceptance were legal restrictions on water use and restrictions on growth and development. The next most feasible were horitcultural techniques and economic solutions. Reuse for agricultural purposes also appeared to have some political feasibility. This study demonstrated the usefulness of survey research in delineating viable water conservation programs.
W79-01987

3E. Conservation In Industry

ENERGY RESOURCES DEVELOPMENT IN WYOMING'S POWDER RIVER BASIN: AN ASSESSMENT OF POTENTIAL SOCIAL AND ECONOMIC IMPACTS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01545

GEOTHERMAL POWER AND WATER PRODUCTION STUDIES AT THE UNIVERSITY OF CALIFORNIA,
California Univ., Berkeley. Sea Water Conversion Lab.
A. D. K. Laird, J. R. Darnell, B. W. Tleimat, G. J. Smith, and F. V. Stickel.
American Society of Mechanical Engineers, Winter Annual Meeting, December 10-15, 1978, Paper 78-WA/Ener-7. 9 p, 12 fig, 4 tab, 8 ref. (California Water Resources Center Desalination Project).

Descriptors: *Geothermal studies, *Thermal powerplants, *Thermal power, *Water sources, Water supply.

This paper summarizes results of studies on geothermal dual-purpose power and water production plants using geothermal and other working fluids. Combinations of heat exchanger and direct contact condensers with evaporative, dry and mixed cooling are considered. Effects of system parameters on production are given. Higher temperatures favor the use of open, or water, cycles, particularly when brines are low in dissolved solids, noxious gases and bicarbonates. At lower temperatures, either the water or the binary fluid cycle may be preferrable, depending on conditions. (Snyder-Calif, Davis)
W79-01546

USE IN THE BRICK INDUSTRY OF HIGHLY DISCOLORED FIBERS RECOVERED FROM THE FINAL EFFLUENT CLARIFIER OF A PAPER MILL (VERWERTUNG VON STARK VERFAERBTEM FANGSTOFF AUS DER REST-ABWASSERKLAERANLAGE EINER PAPIER-FABRIK IN DER ZIEGELINDUSTRIE),
VEB Druck- und Spezialpapiere, Golzern (East Germany).
K. Kirsten, and F. Porschmann.
Zellstoff und Papier, Vol. 27, No. 2, p 83-84, March/April, 1978. 4 illus, 2 ref.

Descriptors: *Pulp wastes, *Fibers(Plant), *Bricks, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Color, Brickmaking industry, Waste disposal, Water reuse.

Fibers reclaimed from clarified (sedimented) paper mill effluents may be reused in papermaking. The use of fibers which are too highly discolored for this purpose is discussed, especially as porosity-improving additives in brickmaking. (Ward-IPC)
W79-01607

COMPONENTS OF A SUCCESSFUL IN-MILL CLOSE UP PROGRAM,
Consolidated Papers, Inc., Whiting, WI.
For primary bibliographic entry see Field 5D.
W79-01613

AUSTRIAN NATIONAL REPORT ON NON-WASTE TECHNOLOGY,
R. Kauders, and U. Ousko-Oberhoffer.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 77-104, 1 fig.

Descriptors: *Pulp and paper industry, *Water pollution control, *Austria, Technology, Economics, Resources, Conservation, Water conservation, Heat, Filters, Slime, Water reuse, Recycling, Coals, Quartz, Gravels, Foreign countries, Europe, Sulfur dioxide, Magnesium oxide, Spent sulfide liquor, Boxboard, Waste paper, Chemical recovery, Chemical industry.

This report outlines and gives some technological and economic details for 19 already practiced procedures plus 3 still under development in Austrian chemical industries for resource conservation and environment protection. Among the approved technologies, two are concerned with pulp, paper, and board manufacture, viz., (1) the Lenzing magnesium bisulfite recovery process for recovering MgO, sulfur dioxide, and heat from spent sulfite liquor of 15% solids content; and (2) the production of folding boxboard (250 tons/day) from a furnish comprising up to 85% waste papers, with considerable water conservation (reduction of waste waters from 8,000 to 1,000 cu m/day) and without water pollution, via a process developed by Ruthner Industrieanlagen AG. (Vienna) which involves 4 closed filter boilers (with quartz gravel and hydroanthracite filter media), a reactivator for separating fines, and dosing of recycled process water with bleach liquor to prevent slime problems. (Brown-IPC)
W79-01621

HOW AND WHY WE CHOSE INTEGRAL RECYCLING (AT THE ISOREL FIBERBOARD PLANT, CASTLEJALOUX, FRANCE),
Isorel, Puteaux (France).
B. Marechal.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 231-238. 5 fig.

Descriptors: *Pulp wastes, *Water pollution control, *Hardboard mills, *France, Control systems, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Aerated lagoons, Water reuse, Recycling, Water conservation, Water pollution, Closed systems, Insulation board, Fiberboard mills, Pollution abatement, Suspended solids.

After considerable efforts and disappointing results with the economics of external effluent treatment measures to abate water pollution at a wet-process hardboard and insulation board factory, the Isorel company developed a closed-circuit manufacturing process involving the installation of a buffer tank between the plant and the river, with two stand-by aerated lagoons in case of pipeline breakage, and a luminous process-control panel for monitoring all sensitive points in the water circuits. Adaptation to the high-solids process stream (90-100 g of dry solids/liter) required modifications in the thermomechanical pulp refining, stock dewatering, and hot-pressing procedures, as well as many smaller adjustments in equipment operation. Water pollution has been drastically cut from 110 to 0.8 kg/ton of building board produced, equivalent to 99.3% efficient abatement. (Brown-IPC)
W79-01622

NON-WASTE PRODUCTION OF BLEACHED KRAFT PULP,
Toronto Univ. (Ontario).
W. H. Rapson, and D. W. Reeve.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 379-384. 13 ref.

Descriptors: *Pulp and paper industry, *Water pollution control, *Kraft mills, Water pollution sources, Pulp wastes, Bleaching wastes, Industrial wastes, Wastes, Canada, Foreign countries, North America, Pollution abatement, Water reuse, Recy-

cling, Effluents, Barking, Pulping, Pulp washing, Pulp bleaching, Chemical recovery.

Barking, pulping, pulp washing, bleaching, chemical recovery, and effluent-recycling technologies developed with government support in Canada to make the pollution-free kraft mill a practical reality are reviewed. (Brown-IPC)
W79-01624

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W79-01674

RECOVERING SYSTEM FOR CHROME-PLATING WASTEWATER CONTAINING CHROMIC ACID (KUROMU MEKKI HAISUI NO SHORI SHISUTEMU),
For primary bibliographic entry see Field 5D.
W79-01767

STATUS OF THE CLOSED-CYCLE CONCEPT KRAFT MILL AT GREAT LAKES PAPER CO.,
Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
J. A. Isbister, D. W. Reeve, and W. H. Rapson.
Paper Trade Journal, p 32-36, October, 1978.

Descriptors: *Industrial water, *Waste reuse, *Bleach wastes, *Recycling, *Industrial wastes, *Pulp and paper industry, Pulp wastes, Evaporation, Biochemical oxygen demand, Corrosion, Desalination, Operation and maintenance, Water pollution control, Pilot plants, Chlorine compounds, Waste water treatment.

The 800 tpd bleached kraft pulp mill operated by Great Lakes Paper Co. in Thunder Bay, Ontario, Canada, accommodated the first application of the Rapson-Reeve (closed-cycle) concept. The 'B' mill, which started up in 1976, employs a D/C-C-E-D-E-D bleach sequence, salt recovery, and high chlorine dioxide use (70%) in the first bleaching stage. Water consumption at the bleach plant is minimized to balance with inputs in the form of recovered filtrate. Four spill pits were incorporated into the design of the closed-cycle system; future efforts will be directed toward collecting all spills during shutdowns and upsets for return to processing without overflow. At present, process effluent is still discharged during upsets. Current objectives for the closed-cycle system include reducing defoamer and bleach chemical consumption, preventing corrosion of washer drums and the recovery furnace precipitator, increasing the black liquor Btu value to reduce external fuel makeup requirements, and improving overall coordination of mill operations. Of the 8.3 ton/day total BOD discharged by the mill, the sextuple-effect evaporator condensates and foul condensates contribute the largest quantity not associated with bleaching operations (4.9 tons/day). On the basis of the performance of the 'B' mill, the Ontario Ministry of the Environment has recommended that a similar closed-cycle recovery system be installed in another Great Lakes Paper Co. mill in the Thunder Bay complex. (Schulz-FIRL)
W79-01773

RATIONALIZATION AND ENVIRONMENTAL PROBLEMS OF BEAMHOUSE OPERATIONS,
For primary bibliographic entry see Field 5D.
W79-01778

DEVICE FOR TREATING WASTE WATER,
For primary bibliographic entry see Field 5D.
W79-01877

3F. Conservation In Agriculture

THE EFFECT OF IRRIGATION ON THE SURVIVAL AND DEVELOPMENT OF PARASITIC NEMATODE LARVAE IN WESTERN MONTANA,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 5C.
W79-01540

UPTAKE AND TRANSLOCATION OF A NONIONIC SURFACTANT BY BARLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W79-01563

NONIONIC SURFACTANT EFFECTS ON GROWTH AND POROSITY OF BARLEY ROOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W79-01564

INVENTORY OF WETLAND HABITAT USING REMOTE SENSING FOR THE PROPOSED OAHE IRRIGATION UNIT IN EASTERN NORTH DAKOTA
South Dakota State Univ., Brookings. Remote Sensing Inst.
R. G. Best, and D. G. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 Price codes: A03 in paper copy, A01 in microfiche. 1977. 14 p, 8 fig, 5 tab, 3 ref, 2 append.

Descriptors: *Wetlands, *Census, *South Dakota, *Aerial photography, *Wildlife habitats, Marshes, Wildlife management, Mapping, Remote sensing, Freshwater marshes, *Oahe irrigation project(SD), *Type I wetlands, Wildlife mitigation plan.

An inventory of wetland for the area included in the proposed Oahe Irrigation Project was conducted to provide supplemental data for the wildlife mitigation plan. This report, including the data summaries, follows a report which documented the interpretation techniques as presented by Best, Moore, and Brewster for inventorying small, predominatly Type I wetlands in the low-relief terrain of the Lake Dakota Plain. Wetland habitat in over 310,000 acres in the Oahe irrigation district was inventoried. There were 5305 wetlands representing 7530 acres, 589 acres of natural drains, and 1545 acres of stream habitat in the area. The data were stored and tabulated in a computerized spatial data analysis system. The data summaries are provided for various spatial stratification. (Steiner-Mass)
W79-01636

SPRINKLER IRRIGATION PRACTICES AND WATER LOSSES: WATER SHORTAGES UNDERLINE NEED FOR CONSERVATION,
Texas Agricultural Extension Service, College Station.
R. L. Duble.
Irrigation Journal, Vol 27, No 2, p 16-17, 20, 46, March-April, 1977. 3 fig.

Descriptors: *Sprinkler irrigation, *Irrigation practices, Irrigation systems, *Water conservation, Water resources, Turf, Irrigation efficiency.

Having witnessed the effects of a water shortage in many sections of the country during the summer of 1976, the value and need for conservation of water can be appreciated. Since scientists forecast more extensive droughts throughout the next decade, people must become more conscious of water use. In order for there to be adequate water supplies for turf irrigation in the future, careful management of water resources is necessary and must be implemented now. (Skogerboe-Colorado State)
W79-01673

HOW THEY'RE HARNESSING THE SUN TO PUMP WATER,
R. Larsen.
Irrigation Age, Vol 12, No 2, p 6-8, October, 1977. 4 fig.

Descriptors: Irrigation, Irrigation practices, Irrigation systems, Solar radiation, *Pumping, *Energy conversion.

Serious efforts to harness the sun's rays for energy have been few. Now there is a major attempt by private firms and government agencies to find a way of using sunlight to power the nation's irrigational systems. (Skogerboe-Colorado State)
W79-01679

AN INTRODUCTION TO EMISSION UNIFORMITY,
Rain Bird Sprinkler Mfg. Corp., Glenora, CA.
For primary bibliographic entry see Field 8B.
W79-01686

MAINLINE INSTALLATION,
AG Water, Shafter, CA.
F. Hamisch.
Drip/Trickle Irrigation, Vol 2, No 2, p 12 and 30, 1977. 1 fig.

Descriptors: *Irrigation systems, Irrigation practices, Irrigation design, Hydraulics, Pipes, Piping systems, Pipelines, *Drip irrigation.

The mainline is an integral part of the drip irrigation system. In order for the installed pipeline to perform properly, it must be properly designed. The pipeline designated must be of the proper size with appropriate protection devices, such as pressure reliev valves, vacuum relief valves, air release valves and check valves. (Skogerboe-Colorado State)
W79-01689

DRIP IRRIGATION AT SUPERIOR FARMING: WATER USE CUT 30%, FERTILIZER 50% BY THIS LARGE CORPORATE FARM,
R. Mallory.
Irrigation Journal, Vol 27, No 3, p 20-21, May-June, 1977. 5 fig.

Descriptors: Irrigation, *Irrigation practices, Irrigation systems, *Irrigation efficiency, Water conservation, *Drip irrigation.

Superior Farming Company, which first started its drip irrigation experiments in 1971, had its 8,000 acres of trees and vines under drip by 1975--20 percent of the total drip irrigated acreage in California at the time. (Skogerboe-Colorado State)
W79-01690

WORLD'S LARGEST SOLAR-POWERED IRRIGATION SYSTEM OPERATING IN ARIZONA: RISING ENERGY COSTS CAUSE EXPLORATORY VENTURE.
Irrigation Journal, Vol 27, No 4, p 14-15, July-August, 1977.

Descriptors: *Arizona, *Irrigation systems, Irrigation practices, *Solar radiation, *Pumping plants, Energy conversion.

The world's largest solar-powered irrigation system was dedicated in late April at Northwestern Mutual Life Insurance Company's Gila River Ranch, southwest of Phoenix. The system, developed by the Columbus Laboratories of Battelle Memorial Institute, includes a 50-horsepower pump capable of delivering up to 10,000 gallons of irrigation water per minute at peak operation. (Skogerboe-Colorado State)
W79-01692

INFLUENCE OF K ON THE UPTAKE, TRANSLOCATION, AND REDUCTION OF NITRATE BY BARLEY SEEDLINGS,
Kentucky Univ., Lexington. Dept. of Agronomy.
D. G. Blevins, A. J. Hiatt, R. H. Lowe, and J. E. Leggett.
Agronomy Journal, Vol. 70, No. 3, p 393-396, May-June, 1978. 5 fig, 1 tab, 17 ref.

criptors: *Nitrates, Translocation, uction(Chemical), *Barley, *Organic acids, abolism, Calcium, *Potassium, Growth cham-, *Hydrogen ion concentration.

absorption, translocation, and metabolism of influenced by the source of N and was influ-d by the source of N and by the availability mobility of counter ions for transport. The ose of this study was to determine the influ-e of K or Ca on nitrate uptake, translocation, reduction in barley seedlings. Six-day-old ey seedlings were grown for 2 to 36 hours in tions of 1.0 meq/liter KNO3 or Ca(NO3)2, containing 0.4 meq/liter of CaSO4. Experi-ts were conducted in a growth chamber at 27C a photosynthetic irradiance of 5.3 mW times 3. Seedlings treated with Ca(NO3)2 (low K) lower levels of nitrate uptake, nitrate reductase ity, and lower organic acid concentrations seedlings treated with 1 mM KNO3. The tion pH and the expressed sap pH of roots and ts of the low K seedlings increased during the riment. The shoots of the low-K seedlings had h lower nitrate concentrations and lower s of nitrate reductase activity than the roots, esting that K plays a major role in nitrate location. These results support the hypothesis potassium malate is cycled from the tops to oots where decarboxylation occurs, providing urce of HCO3(-) for exchange with NO3(-) g absorption. (Skogerboe-Colorado State)
-01693

LUATION OF PEAT AND GRANULAR IN-LUM FOR SOYBEAN YIELD AND N FIX-ON UNDER IRRIGATION,
hington State Univ., Pullman. Coll. of Agri-re Research Center.
. Bezdicek, D. W. Evans, B. Abede, and R. E. ers.
nomy Journal, Vol. 70, No. 5, p 865-868, ember-October, 1978. 1 fig, 5 tab, 15 ref.

riptors: *Nitrogen fixation, *Soybeans, ts, Granules, Symbiosis, *Crop production.

purpose was to evaluate peat and granular lum for effectiveness in nodulation, N fix-, and yield of soybeans in a soil deficient in N. mum yield response from inoculation (less ol) was 3,454 kg/ha (51.4 bu/A) in 1975 and kg/ha (37.9 bu/A) in 1976. Total N fixed was ated to be as high as 311 and 263 kg/ha in and 1976, respectively. The proportion of N derived from N fixation ranged from 71 to ercent. Estimates of total N fixed based on lene reduction were half of those based on plant N. In general, higher soybean yield and r nodulation were obtained with the granular peat carriers, although in these instances, er-than-recommended rates of granular carri-ere used. These studies show that soybeans capable of fixing over 300 kg/ha of N, an nt which is considerably higher than that ted elsewhere. The data suggest that in soy-growing areas where 25 to 40 percent of the N is from fixation, the soybean symbiotic N-system is capable of fixing sufficient N for s far beyond that now reported. (Skogerboe-rado State)
01702

RIENT UPTAKE BY GRASS AND LEACH-LOSSES FROM SOLUBLE AND S-TED UREA AND KCL,
nal Fertilizer Development Center, Muscle s, AL.
Allen, G. L. Terman, and H. G. Kennedy.
nomy Journal, Vol 70, No 2, p 264-268, h-April, 1978. 4 fig, 4 tab, 6 ref.

riptors: *Leaching, Fescues, Sudangrass, Nu-s, *Fertilizers, Nitrogen, *Potassium chloride, response, Lysimeters, *Ureas, *Absorption, ides, *Grasses.

-release fertilizers should provide for more nt nutrient use by the crop as well as reduce ng losses. This study was conducted to meas-ure crop response to N or K in uncoated urea, ammonium nitrate, S-coated urea, and S-coated KCl and to relate leaching losses to NO3 - N and cations. In one series, granular N sources to supply 200 or 400 kg of N/surface ha were mixed with the upper 20 cm of a 1:1 mixture of Norfolk sl (Typic Paleudult) and builders sand contained in 15 cm by 120 cm columns. A second series was similarly fertilized with K sources to supply 100 or 200 kg of K/surface ha. (Skogerboe-Colorado State)
W79-01705

IRRIGATION EFFECTS ON VEGETATIVE AND REPRODUCTIVE DEVELOPMENT OF THREE SOYBEAN CULTIVARS,
Georgia Univ., Athens. Dept. of Agronomy.
D. A. Ashley, and W. J. Ethridge.
Soil Science Society of America Journal, Vol. 42, No. 3, p 467-471, May-June, 1978. 6 tab, 13 ref.

Descriptors: *Soybeans, *Supplemental irrigation, Growth stages, *Plant growth, *Irrigation effects.

This field experiment considered four moisture regimes-no irrigation, full season irrigation, irrigation starting at bloom stage, and irrigation starting at pod fill stage-on three soybean cultivars, 'Ransom', 'Hamptom 266A' and 'Coker 102'. Data were collected for seed yield, pod number and dry weight, dry weight of vegetative components during reproductive developmet and seasonal soil moisture status. The soil was a sandy loam. Full season and bloom stage irrigation treatments produced higher yields than the unirrigated check except for Hamptom 266A in 1974. Yields from plants receiving the podfill stage irrigation treatment were higher than the unirrigated check in drier seasons of 1972 and 1973 but not in 1974. Irrigation beginning at pod fill produced yields equal to the full season and bloom stage treatments in some cases and somewhat lower yields in other cases. Water application prior to blooming greatly increased vegetative dry weight, number, and dry weight of pods. Beginning irrigation during reproductive development had litle effect on vegetative dry weight, but ussually resulted in a greated number of pods late in the season than the unirrigated check. Higher yields and greater response to irrigation were obtained from shorter Ransom plants than the other two cultivars. (Skogerboe-Colorado State)
W79-01708

CROP WATER REQUIREMENT IN RELATION TO CLIMATE AND SOIL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01712

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-01713

ALFALFA WATER USE AND PRODUCTION ON DRYLAND AND IRRIGATED SANDY LOAM,
North Dakota State Univ., Fargo. Dept. of Soils.
J. W. Bauder, A. Bauer, J. M. Ramirez, and D. K. Cassel.
Agronomy Journal, Vol 70, No. 1, p 95-99, January-February, 1978. 2 fig, 3 tab, 12 ref.

Descriptors: *Alfalfa, *Irrigation effects, Soil-water-plant relationships, Moisture stress, Evapotranspiration, *Fertilization, *Crop production, Great Plains, Correlation analysis, *Loam, Sands.

This study was carried out on a Maddock sandy loam soil, a member of the sandy, mixed frigid Udorthentic Haploboralls. Four irrigation levels, ranging from dryland to excessive irrigation, were established as whole plots in a randomized block, split plot design. Eight different fertilizer treatment of P, K, and S were applied to split plots during the 1st year of the study. Under a three harvest per season management system dry matter yield was significantly affected by harvest number and irrigation treatment each year. Within the dryland and deficient irrigation treatment by year, yields decreased with each cutting; with optimum and excessive irrigation, yields varied inconsistently with cutting; yields increased 14 to 330 percent over dryland by increasing irrigation applications. When plant water stress existed throughout the growing season, relative yield correlated with relative evapotranspiration in a near perfect, linear manner. Under nonstress conditions, irrigation, growing season precipitation, and soil water depletion required consideration to attain nearly perfect correlation of relative yield with relative evapotranspiration. The results of this study indicated that under plant water stress conditions, alfalfa dry matter yield is a linear function of plant water use. (Skogerboe-Colorado State)
W79-01715

EFFECT OF SOIL MATRIC POTENTIAL AND SEEDING DEPTH ON EMERGENCE OF BARLEY,
Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
A. R. Sepaskhah, and E. R. Ardekani.
Agronomy Journal, Vol. 70, No. 5, p 728-731, September-October, 1978. 4 tab, 17 ref.

Descriptors: *Barley, Germination, Emerging vegetation stage, *Seeds, Moisture tension, Crop production, Crop response, *Soil matrix potential.

The effect of soil matric potential and seeding depth on emergence percent and rate of emergence of barley were investigated. Seedling emergence of 'Zarjo' cultivar of barley was measured in a Calcixerollic Xerochrept soil at -0.6 to -30.0 bars soil matric potentials and at 2 to 12 cm seedling depths in the greenhouse. Cultivar response to seedling depth was determined by seedling emergence measurements of 'Torsh', Zarjo, and 'Shaneii' cultivars at seeding depths of 2 to 12 cm under the same experimental conditions. Soil matric potential of -30.0 bars reduced the seedling emergence of Zarjo and resulted in the lowest emergence rate. However, soil matric potentials of -0.6 and -1.5 bars also reduced Zarjo emergence at the 12-cm seeding depth. Seedling emergence and emergence rate of Zarjo were lower at the 12 cm seeding depth at all levels of soil matric potentials. The emergence rate was also reduced at the 8-cm seeding depth, but only at -30.0 bars. Seedling emergence of Shaneii was found to be lower than that of the Torsh and Zarjo cultivars. The rates of emergence of the cultivars were not greatly different at the various seeding depths. (Skogerboe-Colorado State)
W79-01718

A METHOD OF PROMOTING PENETRATION OF WATER INTO TIGHT, SLOPING SOIL UNDER DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
D. Hillel.
Soil Science, Vol 125, No 5, p 329-330, May, 1978. 1 fig.

Descriptors: *Irrigation, *Infiltration, *Penetration, Runoff, Evaporation, Root zone, Gravels, Methodology, Drip irrigation.

A method is proposed to increase penetration of water into the root zone, as well as to reduce runoff and evaporation by means of gravel-filled pits under each emitter when drip irrigation is applied to sloping ground of low infiltrability. A sample calculation is provided to help determine the optimal dimensions of the gravel pits. (Skogerboe-Colorado State)
W79-01719

IRRIGATION TIMING-ITS INFLUENCE ON THE EFFECTS OF SALINITY AND WATERLOGGING STRESSES IN TOBACCO PLANTS,
Victoria Dept. of Agriculture, Tatura (Australia). Horticulture Research Station.
D. W. West, and J. D. F. Black.

Soil Science, Vol. 125, No. 6, p 367-376, June, 1978. 1 fig, 4 tab, 33 ref.

Descriptors: Saline water, Water quality, Sodium chloride, Drainage, Soil-water-plant relationships, Oxygen, *Irrigation, Diffusion, Growth chambers, *Tobacco, *Salinity, *Waterlogging.

The effects of irrigation timing on the interaction between salinity and waterlogging, and changes in the oxygen status in the root zone of a heavy soil under tobacco plants irrigated with drip system were studied. Water uptake was significantly reduced by the presence of NaCl in the root zone irrespective of irrigation and drainage treatment. Leaf chloride in all nonsalinized treatments was significantly lower than in all salinized treatments. Both day and night waterlogged saline treatments contained significantly higher leaf chloride than the nonwaterlogged saline treatment. The night-waterlogged saline treatment contained significantly lower leaf chloride than the day-waterlogged saline treatment. Similar trend to higher CL(-) content with day waterlogging was present with petioles and stems. Root CL(-) concentrations were relatively low irrespective of treatment. Leaf sodium concentrations were relatively low irrespective of treatment. Leaf sodium concentrations of day- and night-waterlogged saline treatments were significantly higher than all other treatments, and the day-waterlogged salinized plants had significantly higher leaf Nat than the night-waterlogged salinized plants. The results suggests that plants in a soil with some chance of being waterlogged in the root zone and with NaCl present in the root zone would benefit from being irrigated at night rather than during the day. (Skogerboe-Colorado State)
W79-01720

THE TIMELINESS BENEFIT OF SUBSURFACE DRAINAGE,
Soil Conservation Service, Kankakee, IL.
L. W. Wendte, C. J. W. Drablos, and W. D. Lembke.
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 484-488, May-June 1978. 6 fig, 3 tab, 21 ref. OWRT A-077-ILL(2).

Descriptors: *Subsurface drainage, *Agriculture, *Benefits, *Model studies, Mathematical models, Planting management, Drainage, Spring, Soils, Soil water, Economics, Time, Farm management, Drains, Subsurface drains, Tile drains.

A simulation model was developed to predict available spring workdays and the earliest possible planting dates for soils with a subsurface drainage system. Applying the model to two Illinois soils, it was found that as many as two available workdays in April and 19 days in May are gained by installing a recommended subsurface drainage system. The optimum drain spacing based on the timeliness benefit of earlier corn planting ranged from 24 to 61 m, depending on permeability and soil type. The average annual timeliness benefit for installing the optimum subsurface drainage system was $37 to $156/ha. (Sims-ISWS)
W79-01728

ROOT-SINK DESCRIPTIONS OF WATER SUPPLY TO DRYLAND WHEAT,
Agriculture Research Service, Pendleton, OR. Columbia Palteau Conservation Research Center.
R. W. Rickman, R. R. Allmaras, and R. E. Ramig.
Agronomy Journal, Vol. 70, No. 5, p 723-728, September-October, 1978. 11 fig, 13 ref.

Descriptors: Moisture uptake, *Wheat, *Moisture tension, *Soil water movement, Soil profiles, *Root distribution, Dry farming, Soil-water-plant relationships, Sink, Hydraulic conductivity, *Soil water potential.

Soil water content changes were supplemented with calculations of water flow between soil layers to provide an improved description of water uptake by dryland wheat (Triticum aestivum L.). Water content changes were estimated from neutron meter measurements. Soil water flux was estimated from field measurements of both hydraulic conductivity and hydraulic head gradients; unsaturated conductivity beyond the range of field measurement was calculated with the pore interaction model of Marshall matched to field measured values at 250 mb. Seasonal water-uptake patterns, determined by the root-sink description, differed from those shown by only water content measurements. Peak water-use rates did not coincide with maximum leaf area index, but coincided with the period from heading to completed head extension. Water flux in the profile was important for supplying water during grain filling and was critical in this layered soil, which restricted rooting to depths less than 150 cm. (Skogerboe-Colorado State)
W79-01732

DIFFERENCES AMONG GENOTYPES OF CORN IN THE KINETICS OF P UPTAKE,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark).
N. E. Nielsen, and S. A. Barber.
Agronomy Journal, Vol. 70, No. 5, p 695-698, September-October, 1978. 6 tab, 23 ref.

Descriptors: *Corn(Field), *Phosphorus, Simulation analysis, Soil properties, *Root systems, Correlation analysis, *Absorption, *Kinetics.

Many plant species utilize fertilizer or soil P inefficiently. A survey of 12 inbred corn genotypes (Zea mays L.) grown in water culture indicated a 1.8 to 3.3-fold variation in root weight, root length per unit of plant weight, root length per unit of root weight, and maximal net P influx. Some aspects of the role of genetics were elucidated by comparing the P absorption parameters of five inbreds with those of four single-cross hybrids made from these inbreds. Five single crosses were grown at low and high P levels in the field on a Raub silt loam (Aquic Argiudoll) to test the significance of the measured root parameters on P uptake. Plants were harvested 22, 38 and 51 days after planting. Phosphorus uptake was also simulated by a model using soil and plant root parameters related to P uptake. The correlation between predicted and observed P uptake was r2 = 0.90 for the 22 to 38-day time interval and r2 = 0.98 for the 22 to 51-day time interval. Hence, observed differences among corn single crosses in their plant root parameters were reflected in their P uptake when grown in the field. (Skogerboe-Colorado State)
W79-01733

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan.
For primary bibliographic entry see Field 3C.
W79-01734

EFFECT OF SLOW RELEASE FERTILIZER ON FERTILIZER RESIDUES AND ON YIELD AND COMPOSITION OF FLUE-CURED TOBACCO,
Philippines Univ., College. Coll. of Agriculture.
G. O. San Valentin, W. K. Robertson, J. T. Johnson, and W. W. Weeks.
Agronomy Journal, Vol. 70, No. 2, p 345-348, March-April, 1978. 9 tab, 7 ref.

Descriptors: *Tobacco, Potassium, *Fertilizers, Solubility, Nutrient removal, Sulfur, *Crop production, Sands, Soils.

Tobacco was grown for 5 years on Lakeland fine sandy soil, a soil which retains very little K. Split applications of K2SO4 were compared to single applications of K2SO4 and resin- polyvinyl-, and S-coated K materials. Yields and chemical composition of tobacco leaves and soil were used to measure the relative effectiveness of K treatments. Yields and K contents of tobacco leaves were increased by K fertilization. Split applications of K2SO4 were more effective than single applications at planting. In years with heavy rainfall, applying slowly-soluble sources all at planting was better than applying K2SO4 in split application. Potassium from slowly soluble materials was less readily leached than from K2SO4, resulting in higher concentration of K within 60 cm of the surface at the time of tobacco flowering. When various thickness of S were applied to give a range of K release, the thicker coatings gave higher yields. Treatments that provided higher K content increased total alkaloids and decreased reducing sugars in the first of the two years that they were measured. Application of K fertilizers with reduced solubility should assure good yields, quality and a high level of K in tobacco. (Skogerboe-Colorado State)
W79-01736

WATER SUPPLIES AND COSTS IN RELATION TO FARM RESOURCE DECISIONS AND PROFITS ON SACRAMENTO VALLEY FARMS,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W79-01737

PROFILE MODIFICATION OF A FRAGIUDALF TO INCREASE CROP PRODUCTION
Missouri Agricultural Experiment Station, Columbia.
J. M. Bradford, and R. W. Blanchar.
Soil Science Society of America Journal, Vol. 41, No. 1, p 127-131, January-February 1977. 5 fig, 1 tab, 9 ref. OWRT A-068-MO(4), 14-31-0001-4024 and 5025.

Descriptors: Root penetration, *Soil water, Water availability, Sawdust, Subsoiling, Liming, *Crop production, *Root systems, Soil profiles.

Root development and crop yields are greatly reduced in soils having fragipan layers because of restricted air and water movement, high bulk densities and soil strength, and high acidity. In the first year after soil profile modification by trenching of a Missouri Typic Fragiudalf, available water storage and yields of grain sorghum (Sorghum bicolor (L.) Moench) were increased. Within unmodified areas, sorghum yields averaged 1,841 kg/ha. Deep trenching without chemical or physical additives increased yields to 4,322 kg/ha. Mixing lime, fertilizer, and sawdust with the soil material within the trenches increased grain sorghum yields to 5,98 kg/ha. The sawdust significantly increased water storage and water extraction, resulting in the grain yield increase. Reexcavation of a pit used by the Soil Conservation Service for soil series identification of the Hobson soil showed no signs of soil density or strength reformation during the 16-year period since the pit was refilled.
W79-01740

EFFECT OF FERTILIZATION ON PENNCROSS CREEPING BENTGRASS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
D. V. Waddington, T. R. Turner, J. M. Duich, and E. L. Moberg.
Agronomy Journal, Vol 70, No. 5 p 713-718, 1978. 2 fig 7 tab 15 ref.

Descriptors: *Fertilization, *Turf grasses, Fertility, Productivity, *Nitrogen, *Phosphorus, *Potassium, Soil tests, *Bent grass.

A field study was conducted on fine, mixed soil to determine the effects of N sources (Agrinite, Milorganite, ureaform, and urea), P rates (0, 0.49, 0.98, and 1.95 kg/100 m2), and K rates (0, 0.76, and 1.52 kg/100 m2) on soil nutrient levels and the growth, quality, and chemical compostion of 'Penncross' creeping bentgrass (Agrostis palustris Huds.) maintained as putting green turf. Wilting, disease, chlorosis, and annual bluegrass (Poa annua L.) infestation were used to assess quality. Fertilization with Milorganite increased available soil P and Mg. Application of K increased both tissue and available soil K. However, a greater increase in soil K and a smaller increase in tissue K were obtained by the second additional increment of K than the first one. The greatest change in tissue K occurred with the first incremental addition of K

he greatest change in tissue P was not greatly fected by soil P above 24 ppm. Less severe mmer wilting was observed with Agrinite, Mirganite, and K treatments. Annual bluegrass insion was favored by P and K fertilization and e effect of one was enhanced by the other. ilorganite, which increased soil P, also favored nual bluegrass. (Skogerboe-Colorado State)
79-01754

FFECTS OF CULTURAL PRACTICES ON RAIN YIELD OF IRRIGATED WHEAT,
rizona Univ., Tucson. Dept. of Plant Sciences.
D. Day, E. B. Jackson, and A. Alemu.
gronomy Journal, Vol. 70, No. 2, p 279-282, arch-April, 1978. 4 tab, 21 ref.

escriptors: *Wheat, Cultural control, *Nitrogen, ertilization, Crop production, Planting manageent, Beds, Irrigation, Arizona.

periments were conducted at Yuma, Arizona to dy the effects of N fertilizer treatment in combiion with methods of planting and row positions beds, on the yield and quality of wheat grain. N fertilizer treatments (34, 17 + 17, 68, 34 + 136, and 68 + 68 kg/ha), two methods of nting (on the flat and on beds), and four row sitions on beds (north, south, east, and west) re evaluated. Flat plantings resulted in higher eat grain yields than did bed plantings; however bed plantings produced higher grain volumeights. Within planting methods, N fertilizer atments did not significantly influence grain lds or grain volume-weights. Grain yield coments were similar for both planting methods. eat grown on beds with an east-west orientan produced more heads per unit area, more ds per head, and higher grain yields than did eat produced on beds oriented in a north-south ection. Wheat responded to N fertilization when wn on both flat and bed plantings during the ter months in the Southwest. (Skogerboe-Colo o State)
9-01761

METHODOLOGY FOR TESTING THE ACRACY OF YIELD PREDICTIONS FROM ATHER-YIELD REGRESSION MODELS R CORN,
rdue Univ., Lafayette, IN. Dept. of Agronomy.
L. Nelson, and R. F. Dale.
ronomy Journal, Vol. 70, No. 5, p 734-740, tember-October, 1978. 5 tab, 21 ref.

scriptors: Statistical models, Technology, ather data, *Regression analysis, *Corn(Field), trogen, *Indiana, *Crop production, *Model dies.

alysis of variance (ANOVA) techniques were d to evaluate the accuracy of yield predictions corn in Indiana counties with four statistical dels: (1) Thompson approach, (2) modified mpson approach, with a nitrogen technology n, (3) a 1974 model by Leeper, Runge, and lker and (4) a 1975 model by Dale and Hodges. models (1), (2), and (4), separate versions were eloped with the particular series of weather corn yield data for each county. All models e used to predict yearly average corn yields for unty with data not used to fit the regression fficients. A significant difference among models detected by the ANOVA. Multiple comparitests indicated that regression models (2), (3), (4) were more accurate than model (1). This lt was attributed mainly to the handling of nology or the weather-technology interaction cts on corn yields. The trend variables used in del (1) acted to confound weather and technoleffects and create unstable regression models. ough the direct application of the results of study is limited to Indiana, the methodology testing the accuracy of yield prodictions is ved to have universal application. (Skogerboerado State)
-01766

MANAGEMENT OF IRRIGATED SOYBEANS ON A MODERATELY COARSE-TEXTURED SOIL IN THE UPPER MIDWEST,
North Carolina State Univ. at Charlotte. Dept. of Soil Science.
D. K. Cassel, A. Bauer, and D. A. Whited.
Agronomy Journal, Vol. 70, No. 1, p 100-104, January-February, 1978. 2 fig, 4 tab, 22 ref.

Descriptors: *Soybeans, Supplemental irrigation, Water management(Applied), Fertilization, Nitrogen, *Nitrates, Tensiometers, *Leaching, *Irrigation programs, *Crop production.

The objectives were to determine the yield potential of supplementally irrigated soybeans on moderately coarse-textured soils and to develop an irrigation schedule for efficient water management. The study, conducted on Maddock sandy loam from 1972 to 1974, employed a split-split plot design with water level as the main block and N fertility rates (0, 56, 112, and 224 kg/ha) as sub-plots. Water levels were W1 (dryland), W2 (under-irrigation), W3 (optimum) and W4 (over-irrigation). Sub-sub plots were planting dates in 1972 and cultivars in 1973 and 1974. Grain yields were significantly different for water levels during each of the 3 years. Three-year yield means were 543, 1,823, 2,428, and 2,164 kg/ha for W1, W2, W3, and W4, respectively. The application of 224 kg/ha N fertilizer in 1972 increased grain yield at the 0.95 probability level. An irrigation scheduling based upon tensiometers proved effective in applying irrigation water. Based upon results of this study, it was concluded that soybeans can be seriously considered as a crop to be included in cropping systems for irrigated, moderately coarse-textured soils in the Upper Midwest. (Skogerboe-Colorado State)
W79-01775

EFFECTS OF CORN STOVER, MANURE, AND NITROGEN ON SOIL PROPERTIES AND CROP YIELD,
Guelph Univ. (Ontario). Dept. of Land Resource Sciences.
J. W. Ketcheson, and E. G. Beauchamp.
Agronomy Journal, Vol. 70, No. 5, p 792-797, September-October, 1978. 4 fig, 8 tab, 6 ref.

Descriptors: *Nitrogen, *Fertilizers, *Corn(Field), *Organic matter, Farm wastes, Soil properties, Crop response, Soil treatment, *Crop production.

Residues and farmyard manures are considered important in determining the N fertilizer requirement of crops. This relationship was studied in a 10-year field experiment on a Typic Hapludalf soil (pH 7.8). Five levels of fertilizer N were applied annually with three management treatments which included (1) returning the stover produced by the preceding corn (Zea mays L.) crop, (2) poultry manure equivalent to 112 kg N/ha/year and (3) no stover returned or manure applied. Dry matter yields and N in grain and stover were measured each year. In general, the manure treatment without N fertilizer gave yields comparable with any other treatment. Where fertilizer N was applied, stover resulted in slightly higher yields than where stover was removed. Stover returned to the soil did not increase fertilizer N requirements at normal rates of application. It was concluded that corn stover residue did not affect the N fertilizer requirement of this soil for grain corn production. Annual applications of liquid poultry manure, containing N equivalent to 112 kg/ha, precluded a requirement for fertilizer N. (Skogerboe-Colorado State)
W79-01781

FERTILIZER PLACEMENT EFFECTS ON SOYBEAN SEED YIELD, N2 FIXATION, AND 33P UPTAKE,
lMinnesota Univ., St. Paul. Dept. of Soil Science.
G. E. Ham, and A. C. Caldwell.
Agronomy Journal, Vol. 70, No. 5, p 779-783, September-October, 1978. 2 fig, 4 tab, 20 ref.

Descriptors: *Nitrogen fixation, *Soybeans, *Phosphorus, Radioisotopes, *Fertilizers, Ureas, Seeds, Productivity, *Crop production, *Absorption.

This study was planned to evaluate the efficiency of P fertilizer utilization by field-grown soybeans with different fertilizer placements using 33P labelled fertilizer (35 kg P/ha) on a Waukegan silt loam soil (Typic Hapludoll) low in plant available N and P. In addition, urea (30 kg N/ha) labelled with 15N was added to measure the effect of P fertilizer placement on N uptake and N2 fixation using the 'A' vaue concept concerning the measurements of available soil nutrients developed by Fried and Dean (1952). Soybean seed yield and total P uptake were increased significantly by adding P fertilizer with no differences among the fertilizer placements (seed yield ranged from 3,811 to 4,035 kg/ha compared to 3,200 kg/ha for the control). The 33P labelled fertilizer provided a direct, quantitative measure of the efficiency of plant use of the added P and provided a basis of evaluating the fertilizer placements without the hazards associated with 33P over the 149-day experiment. The 'A' value concept provided a reliable estimate of N2 fixation which agreed with Kjeldahl measurements. (Skogerboe-Colorado State)
W79-01782

ANALYSIS OF FALLOW-FARMING SYSTEMS IN SEMI-ARID AFRICA USING A MODEL TO SIMULATE THE HYDROLOGIC BUDGET,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 2D.
W79-01785

RELATIONSHIP BETWEEN SOIL TEST AND SMALL GRAIN RESPONSE TO P FERTILIZATION IN FIELD EXPERIMENTS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
P. E. Fixen, and P. L. Carson.
Agronomy Journal, Vol. 70, No 5, p 838-844, September-October, 1978. 3 fig, 8 tab, 35 ref.

Descriptors: *Soil tests, *Fertilization, *Phosphorus, *Grains(Crops), Correlation analysis, Regression analysis, Climatic data, Soil properties, Crop response, Organic matter.

Yield data from 74 small grain field experiments over a 13-year period were used to evaluate the relationship between various soil tests and P response. The soil tests examined in this study were the Bray 1 (soil to solution ratio of 1:7, 1:10, 1:20, and 1:50), Olsen P, and P sorption index of Bache and Williams. The crop species included were Triticum aestivum L., Hordeum vulgare L., and Avena sativa L. The highest correlation between soil test value and yield response to P fertilization was found with the Bray 1, 1:50 ($r2 = 0.41$). An additional 23 percent of the yield response variation could be explained by including six additional variables in a multiple regression analysis employing dummy variables. The r value between P sorption index and yield response on alkaline dummy variables. The r value between P sorption index and yield response on alkaline soils was -0.70 but was near zero for acid soils. Differences were also noted in degree of response between parent materials and crop species. Organic matter content appeared to influence response on some soils. (Skogerboe-Colorado State)
W79-01786

DIFFERENTIAL RESPONSE OF SOYBEAN VARIETIES TO SOIL CADMIUM,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
S. F. Boggess, S. Willavize, and D. E. Koeppe.
Agronomy Journal, Vol. 70, No. 5, p 756-760, September-October, 1978. 1 fig, 5 tab, 30 ref.

Descriptors: *Cadmium, Toxicity, *Soybean, Varieties, *Crop response, Sewage sludge, Soil amendments, Trace elements.

The results are presented of a comprehensive survey of the Cd uptake and effect by a number of the prominent soybean (Glycine Max (L.) Merrill) varieties grown on several CdC12 or sewage sludge-amended soils in the glasshouse. In all varieties, Cd toxicity symptoms appeared as a continuum form slight effects observed as a red, red-brown, or puple coloration at the junction of the leaf blade and tetiole, to severe leaf curling and extensive reddening of the leaf veins, chlorosis, and finally a brittle condition followed by abscission of the leaves. All varieties showed increased shoot Cd concentration and decreased dry weight in response to soil CdC12, but varietal differences in the severity of these Cd effects were observed. Further analysis of data for Cd susceptibility suggested that, of the soybean varieties tested on CdC12-ammended soils, Dunfield, Harosoy, Arksoy, Dare, Flambeau, and Scioto were generally the most susceptible while Clark, Mandarin, Munkden, Jackson, and Lee were consistently ranked as less susceptible (Skogerboe-Colorado State).
W79-01826

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,
Abt Associates Inc., Cambridge, MA.
L. C. Kerpelman, B. L. Gettleman, and B. E. Rovin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 524, Price codes: A08 in paper copy, A01 in microfiche. Submitted to Idaho Department of Water Resources, August 1976, 162 p, 39 tab.

Descriptors: *Water resources, *Water conservation, *Water use, *Water management(Applied), *Irrigation, Methodology, Testing procedures, Conservation, Gross income, Farm practices, Water allocation(Policy), *Idaho, *Incentives, Pacific Northwest, Survey data.

This report identifies and measures the relative effects of the legal, institutional, social, and economic factors affecting water conservation and management. These effects are measured in hopes of describing and structuring an incentive program to reduce water use. The most important factor in the state of Idaho concerning water conservation is the management practices and attitudes of farm operators. The report develops measures to assess farm operators' attitudes, water and farm management practices, and reactions to possible water-conservation incentives. The primary data-gathering methods were the Farm Operator Survey, Water-Use Efficiency Ratings, and a Water Organization Survey. The farmers' characteristics discussed in relation to their water conservation attitudes were age, region in which farming took place, income, type of on-farm irrigation system, and water delivery instrumentality. The report presents recommendations concerning which target groups of farmers should be concentrated upon, the structure of incentive programs, how to appeal to the target groups, the medium through which incentive programs are presented to farm operators and the role of water organizations. This report provides a planning basis for the Idaho Department of Water Resources to meet the water resource needs of Idaho citizens. (Coan-NC)
W79-01836

NITROGEN RELEASE CHARACTERISTICS OF ISOBUTYLIDENE DIUREA AND ITS EFFECTIVENESS AS A SOURCE OF N FOR FLUE-CURED TOBACCO,
North Carolina State Univ. at. Raleigh. Dept. of Soil Science.
G. S. Miner, J. P. Lilly, and D. L. Terry.
Agronomy Journal, Vol. 70, No. 3, p 434-438, May-June, 1978. 3 fig, 3 tab, 12 ref.

Descriptors: *Nitrogen, Leaching, *Tobacco, Nutrient remova, Fertilizers, Particle size, *Ureas.

The objectives of this study were to investigate the release characteristics of isobutylidene diurea (IBDU), with N-release characteristics dependent primarily upon the effects of particle size on chemical dissolution rather than the effects of environmental variations on biological activity, in laboratory and greenhouse studies and to evaluate it as a source of N for flue-cured tobacco in the field. Urea, $NaNO_3$, and four particle sizes of IBDU (1.05, 0.75, 0.55, and 0.40 mm) were applied at rates of 200 and 400 mg M per kg of soil to a Norfolk sandy loam (Typic paleudult) in lysimeters and subjected to leaching at 10 invervals over a 109-day period. Percentage removal of N from these sources were observed at different leaching time. The effects of particle size of IBDU on dry matter and N uptake were studied to determine their N release characteristics. IBDU particle sizes of 1.05 and 0.40 mm were compared with $NaNO_3$ and Urea as N sources for flue-cured tobacco. (Skogerboe-Colorado State)
W79-01841

EVALUATION OF NITRAPYRIN AS A MEANS OF IMPROVING N EFFICIENCY IN IRRIGATED SANDS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, D. R. Keeney, L. M. Walsh, and E. A. Liegel.
Agronomy Journal, Vol. 70, No. 5, p 699-703, September-October, 1978. 3 fig, 5 tab, 24 ref.

Descriptors: *Nitrification, Inhibitors, *Nitrogen, Ammonia, Nitrates, Fertilizers, *Potatoes, *Leaching, Osmotic pressure, *Nitrapyrin.

The objective of this research was to determine if optimum levels of N might be maintained throughout the growing season by delaying nitrification with a nitrification inhibitor, Nitrapyrin. Several field experiments were conducted on a Plainfield loamy sand involving various N sources, rates, and times of application with and without Nitrapyrin. Potato tuber yield and the forms and distribution of N in and below the fertilizer bands were determined. Nitrapyrin extended the persistence of applied NH_4 in all experiments, but inhibition of nitrification was of relatively short duration. Nitrapyrin persistence was likely reduced by the more rapid volatilization and hydrolysis in sandy soils. Further, the effectiveness of Nitrapyrin was likely limited by rapid leaching NH_4 out of the Nitrapyrin-treated zone. Application of Nitrapyrin reduced both total tuber yield and the proportion of marketable tubers. The soil sampling data showed that Nitrapyrin maintained a much higher NH_4-N/NO_3-N ratio than comparable nonnitrapyrin treatments. It appears that the predominance of NH_4-N interfered with plant metabolism so that both yield and normal development of tubers were impaired. (Skogerboe-Colorado State)
W79-01847

EFFECTIVENESS OF NITRAPYRIN IN CONTROLLING NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, L. M. Walsh, and D. R. Keeney.
Agronomy Journal, Vol. 70, No. 5, p 704-708, September-October, 1978. 4 tab, 18 ref.

Descriptors: *Nitrification, Inhibitors, *Denitrification, *Nitrogen, Ammonia, Fertilizers, Crop response, *Corn(Field), Nitrapyrin.

Fertilizer N applied in the fall for the next growing season is often less efficient than N applied closer to the time of plant use. Efficiency might be greatly improved by maintaining the N as NH_4, through the use of nitrification inhibitor, Nitrapyrin (2-chloro-6 (trichloromethyl) pyridine). To evaluate this hypothesis, field trials were established during 1975 to 1977 in south central Wisconsin using 84 to 168 kg/ha N applied as anhydrous ammonia with and without 0.55 kg/ha Nitrapyrin. The results indicated that while nitrification can be significantly slowed by application of nitrapyrin, a yield response does not result. It was thought that a response might have been obtained had a crop been grown on the poorly-drained area adjacent to the harvested area since appreciable N appeared to have been denitrified at this site. Nitrification inhibition by nitrapyrin varied widely within the same field. The results illustrated the problems involved in predicting whether nitrapyrin application will be effective in reducing nitrogen losses and increasing yields. (Skogerboe-Colorado State)
W79-01849

TRICKLE EMITTER FOR SUBTERRANEAN IRRIGATION,
R. W. Spears.
U.S. Patent No. 4,100,940, 6 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 972, No 3, p 1006, July 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Subsurface irrigation, Application equipment, Irrigation efficiency, Drip irrigation.

An irrigation pipeline has emitters equipped with discharge nipples for engagement by flexible hoses to release water at a trickle rate at selected subterranean locations within the radii of the hoses. The nipples may be integral with a plastic manifold that is installed between confronting pipe ends and some of the nipples may be blind nipples that are sheared for activation of the emitters as required to meet increased demand for water. One object of the invention is to increase the width of the area that can be irrigated. Another object of the invention is to make the emitter capable of releasing water into the soil at any desired depth including depths below the level of the pipeline instead of the release being limited to levels above the level of the pipeline. This capability makes it unnecessary to bury the pipeline at a depth below the level at which the water is to be released. (Sinha - OEIS)
W79-01860

MASTER-SATELLITE IRRIGATION CONTROL SYSTEM WITH REMOTE PROPORTIONAL TIMING,
Clemar Mfg. Corp., Glendora, CA. (Assignee).
R. L. Ryggles, and V. Panday.
U.S. Patent No. 4,101,786, 13 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 972, No 3, p 1266, July 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Water control, Control systems, Remote control, Instrumentation, Timing, Rates of application, Electronic equipment.

An apparatus and a related method are described for proportionately varying from a master unit the durations of irrigation at valve stations controlled by a number of satellite units. Control signal for starting a programmed sequence of valve operations at all of the satellites in a selected one of two groups of satellites, or for resetting all of the satellites to a 'home' postion are transmitted over a single pair of wires. One embodiment of the invention includes adjustable timing circuitry in the master unit to generate a timing signal which is transmitted to the satellite units over a separate wire, and is utilized to vary the duty cycle of a station timing motor which measures the durations of irrigation. In an alternate counter, and the irrigation times at all of the stations can be varied to the same degree by adjustment of a variable-frequency pulse generator at the master unit. (Sinha - OEIS)
W79-01861

FLOW CONTROL DEVICE FOR AN IRRIGATION DITCH,
Rhode (Richard), Glasgow, MT. (Assignee).
G. L. Graham.
U.S. Patent No. 4,103,495, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation ditches, *Flow control, Irrigation efficiency, Irrigation practices, Water distribution(Applied), Conduits.

A device is described for controlling the flow of water between an irrigation ditch and an adjacent

d. A conduit has a first end opening into the gation ditch and a second end opening into the d to be irrigated. The cover is pivotally at- hed to the first end of the conduit by means of a shaped hinge. A handle is provided on the erior of the cover and can be engaged by a nually-held instrument to pivot the cover to a sition above the conduit where it will rest due to configuration of the hinge part. The conduit is sitioned relative to the irrigation ditch such that first end is recessed inwardly of one side wall the ditch and extends below the bottom wall of ditch. (Sinha-OEIS)
9-01868

TARY SPRINKLER IMPACT ARM SPRING JUSTMENT,
sco Industries, Dallas, TX. (Assignee).
C. Ridgway.
. Patent No. 4,103,828, 9 p, 8 fig, 6 ref; Official zette of the United States Patent Office, Vol , No 1, p 170-171, August 1, 1978.

scriptors: *Patents, *Irrigation, *Sprinkler irri- ion, *Application equipment, Water delivery, gation efficiency, Irrigation practices.

rotary sprinkler is provided with structure for usting the force applied to the impact arm by impact arm spring. The sprinkler has a laterally ected nozzle cooperating with the arm to rotate nozzle and an impact arm journaled on a shaft ending above the nozzle. The arm is mounted hin a cage extending above the nozzle. The e includes a pair of arms extending from the zle on opposite sides of the shaft and terminat- at their upper ends remote from the nozzle in a plate. A helical spring surrounds the shaft and ecured at its lower end to the arm. A bushing mbly is mounted in the top plate of the cage receives the top end of the spring. The bushing mbly may be manually adjusted relative to the plate to vary the force applied by the spring to impact arm. The sprinkler is mounted in a ket-like housing positionable within the ground n that the mouth of the housing is flush with ground surface. The sprinkler responds to the age of water through the nozzle by rising from wer first position retracted in the housing to a ed second position out of the housing. A top er sized to mate with the mouth of the housing ttached to the top plate of the cage such that n the sprinkler is in the first position the top er mates with the mouth of the housing to ose the sprinkler. (Sinha-OEIS)
9-01872

GULATED FLOW-REDUCING DEVICE RTICULARLY USEFUL FOR DRIP IRRIGA- N,
Drori.
Patent No. 4,105,162, 6 p, 7 fig, 6 ref; Official ette of the United States Patent Office, Vol No 2, p 613, August 8, 1978.

criptors: *Patents, *Irrigation, *Irrigation prac- , Flow control, Irrigation efficiency, Applica- equipment, Drip irrigation.

regulated flow-reducing device particularly ul for drip irrigation comprises a flow-retard- member in a housing. The member is formed a circuitous fluid flow pathway defined at in part by recesses formed in both its opposed s. A flat regulator member is placed between flow-retarding member and the housing inlet that the inlet face of the regulator member is ect to the fluid pressure at the inlet of the ing. The flat regulator member is in contact and covers the inlet face of the flow-retarding ber except for its inlet end to provide commu- ion between the latter and the housing inlet. flow retarding member is made of resilient rial so that both its recessed faces are defor- e by the inlet pressure whereby the cross- onal area of the recesses on both faces of the -retarding member are varied in accordance the inlet pressure. (Sinha-OEIS)
-01882

FORAGE YIELD AND FERTILIZER RECOVERY BY THREE IRRIGATED PERENNIAL GRASSES AS AFFECTED BY N FERTILIZATION,
Agricultural Research Service, Boise, ID. Northwest Water Research Center.
C. L. Hanson, J. F. Power, and C. J. Erickson.
Agronomy Journal, Vol. 70, No. 3, p 373-375, May-June, 1978. 3 tab, 5 ref.

Descriptors: *Forage grasses, Hay, Nitrogen, *Fertilization, Crop response, South Dakota, Clays.

The purpose of this study, conducted in western South Dakota on heavy clay soils was to determine forage yield responses and N recovery of three irrigated grasses--reed canarygrass, garrison creeping foxtail, and smooth brome--to single and split N applications. Single N treatments consisted of 0, 56, 112, 224, or 448 kg N/ha applied in March. For the split N applications, these same rates were applied both in March and again after the first hay cutting. Forage yields were maximunm when the grasses were fertilized with 224 kg N/ha in the split applications. First cutting forage N percentage varied between 0.8 to 2.8 for N rates of 56 kg N/ha and above. The percentage of N was highest, frequently over 3%, in second cutting forage from treatments receiving split fertilizer applications. Percent total N recovered increased as fertilizer applications. Percent total N recovered increased as fertilizer rate increased when all N was applied in March, but recovery was highest for the split application of 224 kg N/ha. (Skogerboe-Colorado State)
W79-01885

NITROGEN LOSSES FROM SPRINKLER-APPLIED NITROGEN FERTILIZER,
Nebraska Univ., North Platte. Dept. of Agronomy.
G. W. Hergert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 364, Price codes: A04 in paper copy, A01 in microfiche. Nebraska Water Resources Center, University of Nebraska, Lincoln, Project Completion Report, September 1978, 47 p, 6 fig, 28 tab, 11 ref. OWRT A-045-NEB(1), 14-34-0001-8029.

Descriptors: *Nitrogen, *Fertilizers, Irrigation, *Nitrates, Water quality, *Sprinkler irrigation, *Irrigation practices, *Fertilization, Soil treatment, Water pollution control.

The objective was to examine nitrogen fertilization and irrigation practices on sandy soils with the goal of quantifying losses of nitrogen from sprinkler-applied nitrogen fertilizer. No significant effect of two different irrigation levels or two nitrogen sources on dry matter accumulation or grain yield was shown. The lack of a treatment effect from the irrigation treatments is encouraging because it indicates that optimum corn yields may be obtained with somewhat limited water application. The nitrate-nitrogen concentration in extracted soil water was high. Average nitrate-N concentrations in deep percolating soil water ranged between 70 and 107 ppm. Nitrate-N accounted for essentially all of the leached mineral nitrogen. Leaching losses in 1976 were 26 and 187 kg N/ha for the low and excess irrigation treatments, respectively. Losses in 1977 were 101 kg N/ha and 127 kg N/ha for the low and excess treatments. No appreciable volatilization of nitrogen from the sprinkler applied nitrogen fertilizer occurred. The development of management practices to limit groundwater enrichment with nitrate entails a complete understanding of realistic crop yield potentials, nitrogen requirements for that yield goal and proper water management to insure minimal leaching losses of nitrogen. Detailed management guidelines are discussed.
W79-01893

THE IMPACT OF ENERGY SHORTAGE AND COST ON IRRIGATION FOR THE HIGH PLAINS AND TRANS PECOS REGIONS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
R. D. Lacewell, G. D. Condra, D. C. Hardin, L. Zavaleta, and J. A. Petty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 362, Price codes: A04 in paper copy, A01 in microfiche. Texas Water Resources Institute, Texas A&M University, Technical Report No. 98, September 1978, 63 p, 17 tab, 38 ref. OWRT A-037-TEX(3), 14-34-0001-7091, 7092 and 8046.

Descriptors: *Energy costs, Efficiency, *Irrigation, Groundwater, Pumping, Irrigation distribution, Linear programming, Simulation analysis, *Texas, *Economic impact, Irrigation practices, *Model studies, Irrigation efficiency, Irrigation water, *Texas High Plains, *Texas Trans Pecos, Irrigated agriculture, Temporal analysis.

Results derived from three models to evaluate expected effect of increasing fuel price, fuel curtailment and risk are presented for the Texas High Plains and Trans Pecos. Increasing natural gas price could reduce the value of groundwater by 50 percent. In the Trans Pecos, with the assumption that energy prices would rise faster than crop prices, average economic life expectancy of a typical farm is estimated to be about five years. Implication of rising natural gas price is dramatic and emphasizes the serious need to become more efficient in use of irrigation water. Annual savings resulting from improved efficiency in pumping and applying irrigation were estimated to be several million dollars.
W79-01894

TEMPERATURE DEPENDENCE OF WATER UPTAKE BY PLANT ROOTS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W79-01910

RADIATION AND ENERGY BALANCE OF SPRINKLER AND TRICKLE IRRIGATED FIELDS,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Soil and Water.
J. Ben-Asher, M. Fuchs, and D. Goldberg.
Agronomy Journal, Vol 70, No 3, p 415-417, May-June, 1978. 1 fig, 2 tab, 13 ref.

Descriptors: Water conservation, *Sprinkler irrigation, Tomato, Evaporation, *Evapotranspiration, Energy budget, *Radiation, *Albedo, *Trickle irrigation.

Water conservation claims in favor or trickle irrigation are poorly documented. The radiation and energy balance of tomatoes grown on sand dune soil and on bare soil irrigated by sprinkling and trickling were compared. Under trickle irrigation, the average ratio of five energy balance measurements of evapotranspiration over evaporation pan (Class A) was 0.3, compared with 0.60 obtained under sprinkler irrigation. The comparison of radiation balance over the trickle and sprinkler irrigated plots indicates that the increased radiant heat loss and albedo from the dry portion of the trickle irrigated plot decreases the available evaporative energy at ground level. The smaller radiant heat load combines with the resistance of the dry soil to water flux to reduce the evaporation of the trickle irrigated plot. (Skogerboe-Colorado State)
W79-01990

SUNFLOWER YIELD AND WATER USE AS INFLUENCED BY PLANTING DATE, POPULATION, AND ROW SPACING,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
J. Alessi, J. F. Power, and D. C. Zimmerman.
Agronomy Journal, Vol 69, No 3, p 465-469, May-June, 1977. 4 fig, 4 tab, 8 ref.

Descriptors: Crop response, *Crop production, Temperature, Agriculture, North Dakota, *Sunflowers, *Cultivation.

Sunflower has only recently been grown commercially as an oilseed crop in the drier regions of the Northern Great Plains. This study was conducted to acquire preliminary information on seed yield, oil concentration, and water use for oil-type sunflower as affected by planting date, plant population, and row spacing; and to obtain an indication how these results were affected by yearly variation in precipitation and air temperature. (Skogerboe-Colorado State)
W79-01999

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

INFORMATION FOR RESERVOIR CONTROL IN THE NORTHUMBRIAN WATER AUTHORITY,
Northumbrian Water Authority, Gosforth (England). Directorate of Planning and Scientific Services.
J. Edwards, and P. Johnson.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 3, p 207-216, May 1978. 7 fig, 2 tab, 1 ref.

Descriptors: *Reservoir operation, *Water supply, *Water management(Applied), *Water control, Water resources, Hydrology, Markov processes, Planning, Foreign research, Methodology, Reservoir releases, Regulation, Reservoir storage, Water yield, Reservoir yield, Risks, Droughts, *Great Britain.

A method of deriving information for control of reservoirs during normal conditions or a drought was proposed. The method is based on assigning a Markov Chain structure to reservoir monthly inflows. The method was demonstrated to give useful results for direct supply or river regulating reservoirs. The sensitivity of the method to the acceptable reliability of supply and the relationship between the reservoir release rate, the refill characteristics of the reservoir, and the supply planning horizon were discussed. The inaccuracies in the theory and the data used for the method were outlined. Conversion of control information into control rules was seen as the next development. It is the choice of acceptable risk which will eventually govern control rules. Since this is related to the value of water, it will be necessary to represent the value in some measurable form, and to incorporate with it in a unified objective function three important features associated with failing to meet demand: (1) restriction of supply beyond a nominal threshold beyond which restriction becomes a major disturbance; (2) duration of this restriction; and (3) frequency of its occurrence. The form of this function and how it reflects on control strategy are matters for further investigation. (Humphreys-ISWS)
W79-01502

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
G. C. April, D. O. Hill, H-A. Liu, S. Ng, and S. E. Slocovich.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-15473, Price codes: A07 in paper copy, A01 in microfiche. Report BER 209-112, December 1976. 128 p, 52 fig, 23 tab, 14 ref. NAS 8-29100.

Descriptors: *Alabama, *Planning, *Water resources, *Mathematical models, *Computer models, *Water quality, *Estuarine environment, Remote sensing, Mixing, Intertidal areas, Saline water-freshwater interfaces, Sediment transport, Hydrology, Water pollution, Salinity, Coliforms, Flow rate, Hydrodynamics, *Mobile Bay(Ala), Physio-chemical processes.

Due to the continuing interest in the application of remote sensing, automatic data processing, modeling, and other aerospace related technologies to hydrological engineering and water resources management, an investigation was made that included major hydrological and water resource emphasis for the entire river drainage system which feeds the Mobile Bay estuary, Alabama. The adaptation and implementation of existing mathematical modeling for the purpose of describing the behavior of Mobile Bay were investigated. Of particular importance are the interactions that system variables such as river flow rate, wind direction and speed, and tidal state have on the water movement and quality within the bay system. Programs for the digital computation of these models require minimum effort for utilization. Predictive capabilities are consistent with expectations and are adequate for trend analysis. These analyses may include the assessment of man's activities on bay behavior. (Lardner-ISWS)
W79-01510

SUMMARY REPORT OF THE PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Central Div.
L. D'Alba, and T. Hempfling.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 101, Price codes: A07 in paper copy, A01 in microfiche. Final Report, May 1976. 110 p, 12 fig, 54 tab, 3 ref.

Descriptors: *Great Lakes, *Lake shores, *Erosion, *Lake Michigan, *Lake Huron, *Lake Superior, *Lake Ontario, Shore protection, Damages, Erosion control, Lakes, Bank erosion, Beach erosion, Surveys, Data collections, Data processing, On-site investigations, Economics, Costs, Benefits, Sampling, Flood damage, Statistical methods, Shores, Coasts, Model studies, Cost-benefit analysis, Damages, *Coastal zone management, Pilot study program.

This report described the results of a pilot study of damages in 11 Great Lakes counties for the high water period 1972-1974. The purpose of the pilot program was to develop a reliable and inexpensive reconnaissance data collection method, to initiate coordination between the Corps of Engineers and responsible state and local agencies, and to gather the damage data for the 11 counties. The pilot program helped demonstrate how to streamline some of the data collection methods and pointed out ways to substitute for or eliminate other activities. Total damages resulting from the 1972-1974 high water period seem to be in the magnitude of two to three greater (after adjusting for price level changes and development) than damages for the 1951-1952 period for the 11 counties studied. The most significant conclusion that can be made is that it is not possible to make a comprehensive factual survey and evaluation of shoreline processes, effects, and damages without adequate funds, technical staff, and a suitable time framework for conduct of the study. Data collections for this study are published in 9 appendixes. (See W79-01529 thru W79-01534; W77-10904 and W77-10905) (Humphreys-ISWS)
W79-01528

GREAT LAKES SHORELINE DAMAGE SURVEY, SAINT LOUIS COUNTY, MINNESOTA, APPENDIX I.
Arrowhead Regional Development Commission, Duluth, MN.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 262, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chicago, Ill., North Central Div., Final Report, May 1976. 106 p, 17 tab, 2 ref, 4 append. DACW 23-75-C-0023.

Descriptors: *Great Lakes, *Minnesota, *Lake Superior, *Lake shores, *Erosion, Surveys, Land use, Shore protection, Property values, Flood damage, Beach erosion, Bank erosion, Data collections, On-site investigations, Water quality, Lakes, Coasts, Damages, *Saint Louis County(Minn), Pilot study program.

This is a report of a study of St. Louis County, Minnesota, where shoreland damages were caused by or directly related to the 1972-1974 high water period on the Great Lakes. The report covered one of 11 county pilot studies initiated around the Great Lakes to study shoreland damage. Damage information, consisting of personal and real property loss and their associated costs, has been documented based on self-administered assessments, personal interviews, and field reconnaissance. St. Louis County's North Shore riparian owners were cooperative and eager to provide information. The response rates to survey instruments was 67% for residential owners and 65% for non-residential parcel owners. About two-thirds of the residential and non-residential parcels have been subject to either erosion or flooding during the two year study period. Aerial photo mosacis of county shorelands were included. (See W79-01528) (Humphreys-ISWS)
W79-01529

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
N. P. Lasca, R. G. Pirie, P. C. Tychsen, and G. A. Fowler.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 263, Price codes: A16 in paper copy, A01 in microfiche. Final Report, May 1976. 259 p, 11 fig, 79 tab, 1 ref, 79 plates. DACW 23-75-C-0028.

Descriptors: *Great Lakes, *Wisconsin, *Lake Michigan, *Lake Superior, *Lake shores, Surveys, Erosion, Shore protection, Bank erosion, Flood damage, Beach erosion, Data collections, On-site investigations, Coastal structures, Costs, Sea walls, Retaining walls, Groins(Structures), Damages, *Brown County(Wis), *Douglas County(Wis), *Racine County(Wis), Pilot study program.

This report is a study of Brown, Douglas, and Racine Counties, Wisconsin, where shoreland damages were caused by or directly related to the 1972-1974 high water period on the Great Lakes. The 41 miles of shoreline bordering Brown County on Green Bay are prone to both flooding and bluff erosion. Approximately 1/2 of the shoreline, the shore west of the Fox River, is primarily affected by flooding, while the remaining half, the shore east of the Fox River, is primarily affected by water wave erosion of the low-lying to moderately high bluffs. Bluff recession along the Douglas County shoreline is highly variable, ranging from 38 to 239 feet during the period 1938 to 1973. The mean rate of shore retreat was 95.3 feet during the 35-year period. Virtually the entire length of Racine County's 15 miles of shore suffered damage to some degree in the period Labor Day 1972 to Labor Day 1974 through the erosive action of high storm waves developed on an unusually high lake surface. Aerial photo mosaics of county shoreland also were included. (See also W79-01528) (Humphreys-ISWS)
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
J. M. Armstrong, M. R. McGill, A. M. Kubeck, C. K. Barber, and J. F. Gillette.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 450, Price codes: A13 in paper copy, A01 in microfiche. Final Report, May 1976. 306 p, 21 tab, 66 plates. DACW 23-75-C-0027.

Descriptors: *Great Lakes, *Michigan, *Lake shores, *Lake Michigan, *Lake Superior, *Lake Huron, Surveys, Flood damage, Damages, Erosion, Shore protection, Beach erosion, Bank erosion, Data collections, On-site investigation

oastal structures, Costs, *Muskegon ounty(Mich), *Manistee County(Mich), *Schoolaft County(Mich), *Chippewa County(Mich), Alcona County(Mich), *Huron County(Mich), lot study program.

his is a report that identifies erosion and flood mage in the six named counties caused by or rectly related to the 1972-1974 high water period the Great Lakes. The short-term objective of is study was to determine the financial loss in the ate of Michigan due to high water-induced efcts of flooding and erosion. The long-range goals clude such items as development of planning cision tools, coastal zone management programs, d land use studies for reduction of damage or ss resulting from high water levels. Aerial photo osaics of county shorelands also were included. ee also W79-01528) (Humphreys-ISWS)
79-01531

NGINEERING STUDIES FOR A CONTRACT OR FIELD INVESTIGATION OF HIGH ATER DAMAGE IN OSWEGO COUNTY, EW YORK, APPENDIX IV,
int Lawrence-Eastern Ontario Commission, Watown, NY.
J. Palm..
vailable from the National Technical Information rvice, Springfield, VA 22161 as ADA-031 079, ice codes: A10 in paper copy, A01 in microfiche. nal Report, May 1976. 149 p, 4 fig, 14 tab, 3 pend, 26 plates. DACW 23-75-C-0033.

escriptors: *Great Lakes, *New York, *Lake ntario, *Lake shores, Flood damage, Damages, osion, Beach erosion, Surveys, On-site investigans, Data collections, Shore protection, Coastal uctures, Land use, Costs, High water mark, Oswego County(NY), Pilot study program.

his report is a study of Oswego County, New ork, where shoreland damages were caused by or rectly related to the 1972-1974 high water period the Great Lakes. The shoreline is primarily in ivate ownership and land values are generally w due to the predominance of seasonal resinces and undeveloped land. The entire shoreline s been impacted by flooding and erosion. The agnitude depended primarily on land form and d use. Damages occurred over the entire shoree. The majority were sustained by seasonal resinces and commercial and industrial users. The ost severe damages were to grounds and imovements for seasonal residences and net busiss losses for commercial and industrial uses. The dings of this study reflect that information on mage to structures and physical property is ailable. Information on the impact on the natural vironment of erosion and flooding accompanyg high lake levels is not available. Aerial photo osaics of county shorelands also were included. ee also W79-01528) (Humphreys-ISWS)
79-01532

EASUREMENT OF COASTAL BLUFF RESSION FROM AERIAL PHOTOGRAPHS, USKEGON COUNTY, MICHIGAN, APPENX VII,
ichigan Univ., Ann Arbor. Coastal Zone Lab.
A. Stoker.
vailable from the National Technical Information rvice, Springfield, VA 22161 as ADA-031 080, ice codes: A04 in paper copy, A01 in microfiche. nal Report, May 1976. 65 p, 26 fig, 6 tab, 16 ref, ppend, 3 photo. DACW23-75-C-0027.

escriptors: *Great Lakes, *Lake Michigan, Michigan, *Bank erosion, *Lake shores, Surveys, osion, Measurement, On-site investigations, ata collections, Aerial photography, Methodolo, Erosion rates, Beach erosion, Terrain analysis, otogrammetry, Data processing, Remote sensg, Analytical techniques, *Muskegon unty(Mich), Pilot study program.

his report evaluated the usefulness of aerial phographs in the determination of coastal erosion es. The effectiveness of aerial photographs was amined in terms of availability, type of coverage, and the reliability of the measurements obtained from the photographs. The methods employed were designed to minimize measurement errors by using an accurate measuring instrument and by taking the mean value of three measurements. Tilt errors were minimized by using ground distances to determine photo scales near each site. Relief displacement errors were corrected for where needed, and measurements with location errors were noted. Location errors are considered the most critical because they can not be minimized. The most accurate methods for recession studies would require first order plotting instruments using advanced photogrammetric techniques. The costs involved would by far outweigh any practical application of the information. Only 'ball park' values of rates can be obtained under two possible situations using the methods outlined: when a great deal of erosion occurs over a short period of time, or when measurements are made over a long time interval. Indications of rapid recession over a short time interval usually can be detected by simple observation of the aerial photographs. (See also W79-01528) (Humphreys-ISWS)
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
J. M. Armstrong, M. R. McGill, and J. F. Gillette.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 261, Price codes: A02 in paper copy, A01 in microfiche. Final Report, May 1976. 6 p, 4 tab. DACW 23-75-C-0027.

Descriptors: *Great Lakes, *Erosion, *Michigan, *Data processing, *Lake shores, Statistical methods, On-site data collections, Analytical techniques, Analysis, Distance, Height, Dimensions, Value, Property values, Real property.

The Coastal Zone Laboratory conducted tests in Muskegon and Manistee Counties to compare homeowner perceptions reflected in the self-administered damage assessment with independent measurements. Data were collected and compared from a sample of homeowners in the following categories: present property worth, bluff height, and the distance from the bluff edge to the foundation of the house. These parameters were chosen because they typify homeowners perceptions of monetary value, vertical distance, and horizontal distance. Results of statistical analysis were tabulated. (See also W79-01528) (Humphreys-ISWS)
W79-01534

ANALYSIS OF SEASONAL PERSISTENCE OF CLIMATE IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W79-01538

OPTIMAL REGULATION POLICIES FOR A MULTIPURPOSE RESERVOIR WITH SEASONAL INPUT AND RETURN FUNCTION,
California Univ., Los Angeles. Dept. of System Science.
S. Arunkumar.
Journal of Optimization Theory and Applications, Vol. 21, No. 3, March 1977, p 319-328. 1 fig, 4 ref. (California Water Resources Center Project UCAL-WRC-W-341). OWRT A-043-CAL(3).

Descriptors: *Storage theory, Dynamic programming Water resources, Reservoirs, *Multipurpose reservoirs, *Regulation, *Optimization, Reservoir operation, Water policy.

Optimal regulation policies for a multipurpose reservoir are characterized analytically for the case where the input and return functions are subject to seasonal variations and the return function is piecewise linear, concave, and separable in reservoir volume and discharge. Efficient upper and lower bounds on optimal policies are derived from two important special cases. Necessary and sufficient conditions are obtained for a finite-time horizon optimal policy to be also optimal for the infinite-time horizon. (Snyder-Calif, Davis)
W79-01570

IMPROVEMENT AND EVALUATION OF TECHNIQUES FOR THE MECHANICAL REMOVAL AND UTILIZATION OF EXCESS AQUATIC VEGETATION,
Wisconsin Univ.-Madison. Dept. of Mechanical; and Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
R. G. Koegel, D. F. Livermore, and H. D. Bruhn.
Technical Report, 1978. 69 p, 5 tables, 25 figs, 17 refs. GI 39193, NSF, RANN.

Descriptors: *Aquatic vegetation, *Rooted aquatic plants, *Water harvesting, *Productivity, *Mechanical equipment, *Treatment, *Feeds, Wisconsin, *Dane County(Wisc).

This report describes the development and evaluation of equipment and systems with potential for increasing the cost effectiveness of aquatic plant harvesting. These include accessories and processing equipment to increase the productivity of existing harvesting systems as well as the development of nonconventional systems. In addition, a number of options for utilization of the harvested vegetation are described. Biological and limnological effects of harvesting are discussed.
W79-01584

THE PRODUCTION OF PULP FROM MARSH GRASS.
Mississippi State Univ., Mississippi State. Dept. of Zoology.
A. A. de la Cruz.
Economic Botany, Vol. 32, No. 1, p 46-50, January-March, 1978. 3 fig, 5 ref.

Descriptors: *Pulp and paper industry, *Rooted aquatic plants, *Harvesting, Crops, Marshes, Wetlands, Aquatic plants, Paper industry, Grasses, Romania.

The Romanian Government had develolped and constructed machinery for the large-scale processing of red (Phragmites communis) pulp. The annual harvest of 125,000 tons of dry weight raw reed is based on an ecologically sound natural cycle of reed production. When processed, raw reed yields up to 60% in unbleached pulp which is mixed with wood pulp in the production of fabricated paper. At $85.00/ton of raw reed material, the reed pulp industry amounts to over $10 million annual revenue. (Sthiler Mass)
W79-01630

THE TIMELINESS BENEFIT OF SUBSURFACE DRAINAGE,
Soil Conservation Service, Kankakee, IL.
For primary bibliographic entry see Field 3F.
W79-01728

ON OPTIMAL REGULATION POLICIES FOR CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
S. Arunkumar, and K. Chon.
Operations Research, Vol. 26, No. 4, p 551-562, July-August 1978. 2 fig, 1 tab. OWRT A-043-CAL(4).

Descriptors: *Reservoirs, *Regulation, *Water policy, *Optimization, Benefit maximization, Heuristic approach, Hydrologic aspects, Dams, Reservoir releases, Operations research, Mathematical models.

Optimal regulation policies for two reservoirs, connected in series, with seasonal and possibly cross-correlated inflows, and analytically characterized when the immediate reward function is a piecewise linear concave function of the release and the objective is to mazimize the expected discounted rewards over finite and infinite time horizons. The optimal policies are expressed in terms of certain critical numbers for which upper

and lower bounds are obtained. Proposed is a heuristic approach for multi-reservoir systems under less restrictive assumptions; it is applied to two reservoirs connected in parallel. (Bell-Cornell)
W79-01731

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01744

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN, VOL. I: REPORT.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01827

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. II: APPENDICES A-C.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01828

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01829

WABASH RIVER BASIN COMPREHENSIVE STUDY. VOL I. MAIN REPORT,
For primary bibliographic entry see Field 6B.
W79-01830

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W79-01833

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
For primary bibliographic entry see Field 8C
W79-01835

A LAND STUDY FOR DOWNTOWN LAKE CHARLES,
Houston Univ., TX. Coll. of Architecture.
For primary bibliographic entry see Field 6B.
W79-01838

THE UPPER COLUMBIA NAVIGATION PROPOSAL.
Cornell, Howland, Hayes and Merryfield, Bellevue, WA
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 615, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the Inland Empire Waterways Associaton, Walla Walla, WA, May 1970, 118 p, 3 maps, 12 fig, 41 tab.

Descriptors: *Cost-benefit analysis, *Feasibility studies, *Water resources development, *National income, *Regional development, *Washington, Environmental effects, Social values, Social impact, Recreation, Transportation, Employment, Unemployment, Discount rates, Project feasibility, *Upper Columbia River(WA), Freight traffic, Project life.

The purposes of this study were to make an independent evaluation of the economic and social feasibility of the proposed Upper Columbia navigation extension (125 miles up the Columbia River) and to test the revised procedures of the Special Task Force of the National Water Resources Council. The analysis included: (1) current economic profile of the area immediately affected; (2) results of an evaluation of transportation savings and other income effects from a national viewpoint; (3) regional income effects; (4) expected environmental effects; (5) the project's effect on the wellbeing of people; (6) length of evaluation of project life and the relevance of salvage value and continual maintenance; and (7) the effect of increasing river flow on dredging costs. Objectives to be given equal weight when judging a project for federal funding include: national income; regional development; environmental enhancement; and wellbeing of people. Conclusions indicate that substantial savings from the proposed waterway navigation may exist; that recreational boating would be enhanced; that unemployment in the region would be normally relieved; that proper planning and management during channel dredging would minimize effects of the natural environment; and that the social well-being of the nation may be enhanced by higher rates of economic and population growth, relieving pressure on overcrowded areas. The results are expected to be useful in further consideration of the value of this project and in judging the operational significance of the suggested revised procedures for evaluation of water resource projects. (Coan-NC)
W79-01843

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for the Bentleyville-Fallowfield Regional Planning Commission, PA, March 1968, 27 p, 2 fig, 9 plates, 8 tab.

Descriptors: *Pennsylvania, *Flood forcasting, *Stage-discharge relations, Floods, Indirect flood measurement, Historic floods, Flood data, Flood recurrence interval, Flood stages, Peak discharge, Flood peak, Flow duration, Standard project flood, Somerset(PA), Bentleyville(PA), Fallowfield(PA), *Pigeon Creek(PA), Intermediate regional flood.

The study area is the Pigeon Creek flood plain located in Fallowfield Township, Somerset Township, and Bentleyville in Washington County, Pennsylvania. The flood plain is generally narrow with the widest portion in the Bentleyville Area. Damageable development in the study area is contained primarily in Bentleyville and consists of residential and commercial establishments. Flood data were obtained from maps, interviews with local residents, newspaper files and historical records. There are no existing flood plain regulations in the study area and no existing, authorized or proposed flood control measures in the surrounding watershed. The main flood season for Pigeon Creek is in winter and early spring. Floods generally result from heavy rains and rapid snowmelt but occasionally are caused by intense thunderstorms. The greatest flood on Pigeon Creek occurred at Bentleyville on August 5, 1956, with a peak discharge of 4,100 cubic feet per second (cfs). The Intermediate Regional Flood is estimated to have a discharge of 5,000 cfs near the Van Voorhis Highway bridge. At the same location, the Standard Project Flood would have an average discharge of 9,000 cfs. This report provides a basis for further study and planning to minimize vulnerability to flood damages. (Coan-NC)
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILLWATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta County, CA., October 1977, 12 p, 4 fig, 16 plates, 5 tab.

Descriptors: *California, *Flood forecasting, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Flood profiles, Historic floods, Flood data, Flood stages, Flood peak, Flow characteristics, Flood damage, Erosion, Deposition(Sediments), Flood protection, Flood plain zoning, Zoning, Dams, *Clover Creek(CA), *Stillwater Creek(CA), Loomis Corners(CA), Sacramento River(CA), Shasta County(CA), 100-year flood, 500-year flood.

The study area includes the flood plains of Clover Creek from Hartnell Avenue to River Valley Drive, Stillwater Creek, and the lower reaches of Salmon and Clough Creeks in the vicinity of Loomis Corner's in Shasta County, CA. These creeks are tributaries of the Sacramento River. The streams together drain approximately 70 square miles. Development in the study area may be generally classified rural and rural-residential with very limited commercial activity. Flood data were gathered from topographical maps, newspaper files, and various governmental agencies. The only existing flood control project having an effect on the study area is Shasta Dam, located on the Sacramento River in the foothill region north of the study area. Information on past floods is very limited because neither streamflow records nor eyewitness accounts are available. Flooding generally results from prolonged winter rainstorms occurring anytime during the period November through March. Flood hazards along Clover Creek are minimal and could be handled by channel alterations. All 7 of the road bridges across Stillwater Creek are considered obstructive to flood flows. Peak flows for the 100-year flood and 500-year flood on Stilldwater Creek at Dersch Road would be 21,000 cubic feet per second (cfs) and 29,000 cfs, respectively. on Salmon Creek at Old Alturas Road peak flows would be 2,100 cfs and 2,900 cfs for the 100-year and 500-year floods, respectively. This report will aid in planning the best use of lands subject to inundation from 100- and 500-year floods. (Coan-NC)
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
Prepared for City of Olney, TX. June 1976, 35 p, 6 fig, 11 plates, 8 tab.

Descriptors: *Texas, *Flood data, Floods, Floodwater, Flood flow, River flow, Indirect flood measurement, Flood forecasting, Historic floods, *Peak discharge, Flood stages, Flow duration, Stage-discharge relations, Flood damage, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Floodproofing, *Salt Creek(TX), Olney(TX), Mud Creek(TX), 100-year flood, 500-year flood, Flood plain management.

The study area is the watershed of Salt Creek near Olney, Young County, Texas, located in the larger Brazos River Basin. The floodplains of Salt Creek are primarily rural except for residential, industrial, and commercial development located within the city of Olney itself. The sources of flood data include U.S. Geological Survey gaging stations, National Weather Service records, topographical maps, and historical documents and records. There are no existing structural flood damage reduction measures along Salt Creek or its tributaries. Most of the flood-producing thunderstorms and rainfall

r in the spring and early fall, but may occur at time. Natural obstruction to flood flows in- e trees, brush, and other vegetation growing g the stream banks in flooding areas. Peak d discharges were not availble for Salt Creek the worst flood in the area occurred on the os River near Seymour, Texas, in October, , with a peak discharge of 95,400 cubic feet econd (cfs). The 100-year and 500-year floods alt Creek are predicted to reach discharges of 0 cfs and 50,000 cfs, respectively below the w Pond Circle. Peak discharges for Mud k, a tributary of Salt Creek, would be 8,900 or the 100-year flood and 12,400 cfs for the ear flood. Guidelines for flood plain manage- are presented, including both regulatory and egulatory methods of flood control. This rt is intended to provide information on flood rds and guidelines for flood plain management. n-NC)
-01852

OD PLAIN INFORMATION: FRANK- WN BRANCH, JUNIATA RIVER, CLAYS- G, PENNSYLVANIA.
y Engineer District, Baltimore, MD.
ared for Blair County Planning Commission, Feb 1977, 26 p, 11 fig, 14 plates, 4 tab.

riptors: *Pennsylvania, *Flood data, *Stage- arge relations, Floods, Indirect flood mea- ent, Flood forecasting, Historic floods, d recurrence interval, Flood stages, Peak dis- e, Flood protection, Warning systems, burg(PA), Frankstown Branch(PA), *Juniata (PA), East Freedom(PA), 100-year flood, ear flood, Blair County(PA).

study area is the portions of the towns of burg and East Freedom, Pennsylvania sub- o flooding from the Frankstown Branch of uniata River. Properties along these streams rimarily residential, with some commercial gricultural development. No stream gages are d within the study area. Flood data were red from U.S. Geological Survey bench mark s and newspaer accounts of past floods. from the Frankstown Branch have occurred g all seasons of the year with acute flooding g the spring season, resulting from snowmelt, rains, and some hurricane activity. There present plans for flood control projects and ning ordinances, building codes or other reg- y measures for the reduction of flood dam- Many of the bridges in the study area are ctive to flood flows. The worst flood prob- occurred on March 18, 1936, but no actual ls of discharges or cost of damages were ble. Other large floods occurred in 1973, 1961 and 1972. At the mouth of the Frank- Branch, the 100-year flood would discharge cubic feet per second (cfs), while the 500- lood would discharge 28,400 cfs at the same n. This study was authorized to provide a or the development of flood plain manage- measures by the Blair County Planning Com- n. (Coan-NC)
01853

D PLAIN INFORMATION: MUDDY CH, MONTGOMERY COUNTY MARY- .
Engineer District, Baltimore, MD.
red for Maryland-National Capital Park and ng Commission, June 1972, 21 p, 2 fig, 11 5 tab.

ptors: *Maryland, *Flood stages, *Peak dis- e, Floods, Indirect flood measurement, Flood sting, Flood profiles, Historic floods, Flood ence interval, Flood peak, Flow duration, discharge relations, Flood damage, Bank n, Standard project flood, Flood protection, plain zoning, Warning systems, Zoning, ly Branch(MD), Montgomery County(MD), d(MD), Gaithersburg(MD), Intermediate al Flood.

tudy area is the flood plain of Muddy n, a tributary of the Potamac River near Gaithersburg, Maryland. The Muddy Branch watershed drains and area of 19 square miles and is located entirely within Montgomery County. Except for highways and bridges, development in the flood plain is limited to scattered residential developments and a commercial-industrial complex. Muddy branch is an ungaged stream so flood data were gathered from interviews with local residents and historical records. There are no existing authorized, or porposed flood control measures in the Muddy Branch area. A county subdivision ordinance restricts residential and commercial development in the 50-year flood plain. Flood data are provided for streams in the vicinity of Muddy Branch. The greatest recorded flood occurred on Seneca Creek, near Dawsonville, in July 1956 discharging 15,000 cubic feet per second(cfs). Flooding occurred in the Muddy Branch flood plain in 1956, 1967, 1969, 1970 and 1971. The Intermediate Regional Flood near the mouth of Muddy Branch would discharge 4,800 cfs, rising to 14.8 feet above streambed. The Standard Project Flood would discharge 10,600 cfs, rising to 22.3 feet above planning on the part of planning agencies trying to minimize flood damages.(Coan-NC)
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta and Tehama Counties, CA., August 1978, 18 p, 13 fig, 23 plates, 5 tab.

Descriptors: *California, *Flood profiles, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Storms, Cloudbursts, Historic floods, Flood data, Flood stages, Flow characteristics, Flood damage, Flood protection, Control structures, *Cottonwood Creek(CA), *Battle Creek(CA), Sacramento Valley(CA), Shasta County(CA), Tehama County(CA), 100-year flood, 500-year flood.

The study area includes the flood plains along the Sacramento River and Cottonwood and Battle Creeks in the Cottonwood-Bend area, Shasta and Tehama Counties, California. The region is in the upper end of the Sacramento Valley, the northern sector of the central valley of California. Development in the flood plain area is primarily limited to residential and agricultural sites. Flood data were gathered from library sources, U.S. Geological Survey topographic maps, newspaper reports, and from other governmental agencies. The main flood control structure is Shasta Dam which provides protection from rainfloods and snowmelt runoff originating in the Sacramento River Basin above Shasta Lake. Flooding generally results from intense widespread storms occurring from November through April, and occasionally, from snowmelt runoff during April through June. Five of the bridges in the study area are considered obstructive to flood flow. The worst flood on the Sacramento River after construction of Shasta Dam occurred in January 1970, discharging 157,000 cubic feet per second (cfs). On Cottonwood and Battle Creeks, the worst floods occurred in January of 1974 and 1970, respectively, discharging 70,000 cfs on Cottonwood Creek and 24,300 cfs on Battle Creek. Peak flows for the 100-year and 500-year floods on the Sacramento River near Bend bridge would be 288,000 cfs and 535,000 cfs, respectively. On Cottonwood Creek the 100-year flood would discharge 106,000 cfs and the 500-year flood, 156,000 cfs, while on Battle Creek the discharge would be 36,200 cfs and 52,400 cfs, respectively. This report will aid in planning the best use of lands subject to inundation from 100- and 500-year floods. (Coan-NC)
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Pawhuska, OK, June 1974, 30 p, 7 fig, 11 plates, 5 tab.

Descriptors: *Oklahoma, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flooding, Flood flow, Historic floods, Flow duration, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Control structures, Reservoirs, *Bird Creek(OK), Pawhuska(OK), Intermediate Regional Flood.

The study area includes Bird Creek, its tributaries, and their flood plains in the vicinity of Pawhuska, Oklahoma. Developments in the flood plain include commercial, residential, and industrial land uses. Flood data were obtained from topographic maps, field studies and historical sources. Since no stream gage records were available, flood profile projections were based on data from watersheds in the region with similar characteristics. Intense thunderstorms cause most flooding in the region, from May through October. The worst known flood occurred in 1915. Recent major floods occurred in 1959 and 1974. On Bird Creek, the Intermediate Regional Flood (IRF) would discharge 38,700 cubic feet per second (cfs) and would rise 3.1 feet, while the Standard Project Flood (SPF) would discharge 75,900 cfs and would rise 8.5 feet. A water supply reservoir in the area provides some flood control capacity which results in lowering the water surface elevations of the IRF on Bird Creek through Pawhuska by about 2 feet. No other structural flood control measures are anticipated. Non-structural measures have not been enacted. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01856

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK, PROVO, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for Board of County Commissioners, Utah County, UT, May 1972, 34 p, 12 fig, 12 plates, 6 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Flow characteristics, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Reservoirs, *Provo River(UT), Provo(UT), *Slate Canyon Creek(UT), Utah County(UT), Intermediate Regional Flood.

The study area includes the Provo River flood plain and the Slate Canyon Creek outwash fan in Provo, Utah. Both flood plains contain some residential and commercial developments, but they are mostly devoted to non-intensive land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Deer Creek Reservoir provides incidential flood control. A flood control reservoir has been authorized. Flooding along the Provo River results primarily from snowmelt originating above Deer Creek Reservoir when the reservoir is full. These floods occur from late April through early July. Flooding on the Slate Canyon Creek outwash fan results from high intensity convective-type thunderstorms centered over the tributary area. These floods occur from May through September. The worst flood recorded at the Provo gage occurred on May 6, 1952, discharging 2,520 cubic feet per second (cfs). At the downstream study limit, the Intermediate Regional Flood would discharge 3,000 cfs and would crest at 4494 feet mean sea level (msl), while the Standard Project Flood would discharge 5,200 cfs and would crest at 4494.5 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA, OKLAHOMA.
Army Engineer District, Tulsa, OK.

Group 4A—Control Of Water On The Surface

Prepared for City of Henryetta, OK, August 1975, 24 p, 5 fig, 14 plates, 5 tab.

Descriptors: *Oklahoma, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flood flow, Historic floods, Flow characteristics, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, *Coal Creek(OK), Henryetta(OK), Intermediate Regional Flood.

The study area includes Coal Creek, its tributaries, and their flood plains in the vicinity of Henryetta, Oklahoma. Land use in the flood plain is residential, commercial, and agricultural. Intense thunderstorms cause most floods in the area from April through September. Flood data were obtained from topographic maps, field studies, and historical sources. No stream gage records are available. The worst known flood occurred on April 14, 1945. In the lower study reach, the Intermediate Regional Flood would discharge 12,400 cubic feet per second (cfs) and would rise 12.5 feet, while the Standard Project Flood would discharge 21,200 cfs and would rise 15.5 feet. Historic and projected flood data are also presented for the rest of the study area. Structural flood control measures neither exist nor are they anticipated. Non-structural measures have not been enacted. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
Prepared for Montgomery County, Texas, March 1974, 32 p, 6 fig, 22 plates, 4 tab.

Descriptors: *Texas, *Flood data, *Peak discharge, *Stage-discharge relations, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood stages, Standard Project Flood, Flood protection, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, *Panther Branch(TX), *Bear Branch(TX), Montgomery County(TX), Flood plain management, Intermediate Regional Flood.

The study area includes the floodplain of Panther Branch extending 16 stream miles northwest from its confluence with Spring Creek, and that of Bear Branch extending 10 stream miles northwesterly from its confluence with Panther Branch. Both streams are located in southeast Montgomery County, Texas, near Houston. Development in the flood plain is primarily agricultural, but because of development pressure in metropolitan Houston, residential and suporting service facilities are being built. There are no stream gage or discharge records available for Panther or Bear Branches. Flood data were collected from newspaper files, topographical maps, and the NOAA Weather Service. Obstructions in the stream flow are both manmade and natural, consisting of road crossings, landfills and bridges, trees, brush, and other vegetation. There are no flood control structures in the study area. Flooding is caused by intense local thundershowers, general storms and hurricanes, all occurring at any time of the year. Recent major floods occurred in 1960, 1961, 1964, 1966, 1968, 1972 and 1973. On Panther Branch, the Intermediate Regional Flood (IRF) would discharge 14,000 cubic feet per second (cfs), rising to 12 ft above the streambed, while the Standard Project Flood (SPF) would discharge 23,000 cfs and rise to 14.9 ft. above streambed. On Bear Branch, the IRF would discharge 8,900 cfs, rising to 12 ft above streambed; the SPF would discharge 14,700 cfs, rising to 14.9 ft. above streambed. Specific guidelines for flood plain management are presented, particularly non-structural alternatives. This report is intended to provide definitive data to aid in planning the best use of flood prone lands, or otherwise contribute to the solution of local flood problems. (Coan-NC)
W79-01859

FLOOD FREQUENCY DESIGN IN SPARSE-DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. F. Carlson, and P. M. Fox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 389, Price codes: A02 in paper copy, A01 in microfiche. Report IWR-94. 1978. 11 p, 6 ref. OWRT B-030-ALAS(2), 14-31-0001-5217.

Descriptors: *Alluvial channels, *Design flood, *Flood frequency, Hydrologic data, Scour, Flood protection, *Design criteria, *Alaska, Risks, Data collections, Pipelines, *Northern region(Alas), *Bayesian analysis, *Sparse data.

The project was directed towards improved techniques for flood capacity design in areas of extremely sparse data such as cold regions. The work included development of the appropriate risk selection with Bayesian analysis techniques. As most flood determination procedure involves some type of model calculation a portion of the work was aimed towards an appropriate model choosing technique. Several techniques were developed to describe the channel dynamics of northern braided rivers with particular emphasis on scour phenomenon and engineering structures. A field review of existing hydraulic engineering design performance examined bridge, culvert, and pipeline crossings along the Alyeska oil pipeline route from Fairbanks to Prudhoe Bay. A Bayesian based risk analysis procedure incorporated the model selection, the design hydrology, the channel geometry and the design demands in such a way so as to provide maximum reliability with very little available data. The report includes abstracts of eight publications which have been prepared as a result of the project.
W79-01901

REMOTE SENSING ASSESSMENT OF DAM FLOODING HAZARDS: METHODOLOGY DEVELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. P. Berger, W. R. Philipson, and T. Liang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 371, Price codes: A04 in paper copy, A01 in microfiche. Research Project Technical Completion Report, November, 1978. 61 p, 23 fig, 8 tab. OWRT A-081-NY(1). 14-34-0001-8034.

Descriptors: *Remote sensing, *Dams, *Aerial photography, Satellites(Artificial), *Flood control, *Hazards, Dam failure, *Dam safety programs, *New York, Methodology, Data collections, Mapping, Evaluation, Surveys.

The value and use of remotely sensed aircraft and satellite data for inventorying dams, determining their hazard class, and assessing their condition is described. A methodology is developed to increase the efficiency and accuracy of dam inspection in New York State by incorporating remote sensing techniques into the State Dam Safety Program. The methodology places emphasis on readily available remotely sensed data--aerial photographs and Landsat data. Aerial photographs are employed in establishing a statewide data base, referenced on county highway and U.S. Geological Survey 1:24,000 scale, topographic maps. Data base updates are conducted by region or county, using Landsat or aerial photographs as a primary source of information. Field investigations are generally limited to high-hazard or special problem dams, or to dams which cannot be assessed adequately with aerial photographs. Although emphasis is placed on available data, parameters for acquiring new aircraft data are outlined and various sensors considered. Large scale (1:10,000) vertical, stereoscopic, color-infrared aircraft photography, flown during the spring or fall, is recommended for assessing dam condition.
W79-01980

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 7C.
W79-01989

4B. Groundwater Management

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 8B.
W79-01503

EXPERIENCE IN ARTIFICIAL GROUNDWATER RECHARGE FOR WATER SUPPLY IN LITHUANIA,
I. P. Dilyunas.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 340-343, 1976. 3 fig, 5 ref. Translated from Hydraulic Engineering and Reclamation (Gidrotekhnika i melioratsiya), No. 7, p 78-84, 1976.

Descriptors: *Groundwater recharge, *Water supply, *Aquifers, *Artificial recharge, Recharge Pit recharge, Induced infiltration, Recharge wells, Injection wells, Water reuse, Infiltration rates, Foreign research, Foreign countries, Water quality, Percolation, On-site tests, On-site investigation.

Lithuania has large groundwater resources because of its location in the temperate climatic belt with ample precipitation (500-850 mm/year), its dense drainage network (averaging 0.4 km/sq km), and the widespread occurrence of sandy-gravel mantle deposits in the Quaternary glacial stratum which is 100-150 m or more thick. Systematic investigations of groundwater recharge methods for water supply have been conducted since 1960. An alluviall aquifer 9-20 m thick in sandy-gravel deposits is exploited in the area of the Eygulya water intake. The groundwaters are recharged artificially from two infiltration basins with infiltration areas of 4,250 and 3,790 sq m at a filling depth of 3.2-3.4 m. Their beds consist of coarse-grained sand underlain by gravelly-pebbly deposits. Infiltration occurs without backwater: the depth from the bottom of the basins to the groundwater remains at 6-6.5 m throughout the infiltration cycle. The percolation rate during the infiltration cycle varies from 2.8 to 0.05 m/day and averages 0.5 m/day. Artificial groundwater recharge is justified in all the cases examined. This is a fairly efficient water supply method under the conditions prevailing in Lithuania, and it should be used to replenish the exploitable groundwater reserves. (Humphreys-ISWS)
W79-01508

SIMULATION OF FLUID-ROCK INTERACTIONS IN A GEOTHERMAL BASIN,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 2F.
W79-01516

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01522

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-01535

HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA,
Montana Coll. of Mineral Sciences and Techn

y, Butte.
r primary bibliographic entry see Field 5B.
79-01542

EOTHERMAL POWER AND WATER PRO-
UCTION STUDIES AT THE UNIVERSITY OF
ALIFORNIA,
lifornia Univ., Berkeley. Sea Water Conversion
b.
r primary bibliographic entry see Field 3E.
79-01546

NONSTRUCTURAL APPROACH TO CON-
OL SALT ACCUMULATION IN GROUND
ATER,
lifornia Univ., Davis. Dept. of Civil Engineer-
.
r primary bibliographic entry see Field 5G.
79-01735

OLOMITIZATION IN THE FLORIDAN
QUIFER,
orida Univ., Gainesville. Water Resources Re-
rch Center.
r primary bibliographic entry see Field 2F.
79-01749

ETHOD AND MEANS OF TREATING
ATER WELLS,
oran (Thomas L.), Amarillo, TX. (Assignee).
r primary bibliographic entry see Field 3B.
79-01871

SENIC LEVELS IN THE SURFACE AND
OUND WATERS ALONG WHITEWOOD
EEK, BELLE FOURCHE RIVER, AND A
ORTION OF THE CHEYENNE RIVER,
UTH DAKOTA,
ological Survey, Vermillion, SD.
r primary bibliographic entry see Field 5A.
79-01897

CURRENCE OF IRON BACTERIA IN
OUND WATER SUPPLIES OF ALABAMA,
burn Univ., AL. Water Resources Research
t.
r primary bibliographic entry see Field 5B.
9-01908

ALYTICAL STUDY OF THE OGALLALA
UIFER IN TERRY COUNTY, TEXAS, PRO-
CTIONS OF SATURATED THICKNESS,
LUME OF WATER IN STORAGE, PUM-
GE RATES, PUMPING LIFTS, AND WELL
ELDS,
xas Dept. of Water Resources, Austin.
r primary bibliographic entry see Field 7C.
9-01927

ALYTICAL STUDY OF THE OGALLALA
UIFER IN YOAKUM COUNTY TEXAS,
OJECTIONS OF SATURATED THICKNESS,
LUME OF WATER IN STORAGE, PUM-
GE RATES, PUMPING LIFTS, AND WELL
ELDS,
as Dept. of Water Resources, Austin.
primary bibliographic entry see Field 7C.
9-01928

ALYTICAL STUDY OF THE OGALLALA
UIFER IN COCHRAN COUNTY, TEXAS,
OJECTIONS OF SATURATED THICKNESS,
LUME OF WATER IN STORAGE, PUM-
GE RATES, PUMPING LIFTS, AND WELL
ELDS,
as Dept. of Water Resources, Austin.
primary bibliographic entry see Field 7C.
9-01930

ALYTICAL STUDY OF THE OGALLALA
UIFER IN LUBBOCK COUNTY, TEXAS,
OJECTIONS OF SATURATED THICKNESS,

VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
For primary bibliographic entry see Field 7C.
W79-01931

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
R. F. Brown, D. C. Signor, and W. W. Wood.
Report No. 220, August 1978. 32 p, 23 fig, 1 tab, 23 ref.

Descriptors: *Water management(Applied), *Groundwater, *Aquifers, *Water-spreading basins, *Injection wells, *Artificial recharge, *Southwest U.S., *Ogallala Formation, Texas, New Mexico, Southern High Plains(TX, NM), Plains, Irrigation, Lakes, Playas, Permeability, Flocculation, Pumping, Costs, Arid lands, Clays, Dry farming, Reclamation states.

Two methods of artificial groundwater recharge in the Ogallala Formation aquifer in the southern high plains of Texas and New Mexico are described: (1) water-spreading basins, and (2) injection wells. Both systems use water collected in the thousands of playa lakes in the region; this water normally evaporates rapidly (about 12.7 mm/day in summer). Little water moves downward from the playas due to clay-sealed central basins. The Ogallala aquifer receives less than two mm water/year under present climatic conditions, but an average of 305 mm are withdrawn annually. Most irrigated farms in the central and southern parts of the southern high plains will becme dryland farms before the year 2000 at the current rate of water use. Field tests and laboratory research indicate that spreading basins are the most economical approach to recharge in most areas, but where surficial materials have low vertical permeability, injection wells offer a viable alternative. Both systems: (1) pump water from the playa lakes, preferably from near the surface to reduce sediment load; (2) treat the water with a flocculant to speed settling of sediment; and (3) hold the water in a settling basin for sedimentation. With spreading basins, the clarified water is pumped into the basins, located in an area with highly permeable sediments (greater than 0.3 m/day surface, 0.06 m/day below). In areas with impermeable sediments, water is pumped into the aquifer by way of injection wells. (Lynch-Wisconsin)
W79-01992

4C. Effects On Water Of Man's Non-Water Activities

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
For primary bibliographic entry see Field 6G.
W79-01515

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W79-01518

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

SOLAR RADIATION AND URBAN HEAT ISLANDS,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W79-01568

WETLANDS OF THE UNITED STATES: THEIR EXTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6B.
W79-01635

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W79-01650

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 944, Price codes: A11 in paper copy, A01 in microfiche. October 1976. 17 fig, 1 tab, 106 ref.

Descriptors: *Georgia, *Coasts, *Land management, Wetlands, Inland waterways, Coastal marshes, Land use, Estuaries, Coastal waterways.

Information has been assembled related to the impact of inland land use activities on Georgia's coastal waters, including marshes and estuaries. Natural resource processes which affect the impact of inland activities, such as flows of water, sediments, and nutrients, are described. In addition, available information describing impacts from forestry, agriculture, urbanization, and large-scale public works projects are included. Although the report does not contain policy recommendations, this background information is useful for developing coastal zone management program goals and objectives. (Steiner-Mass)
W79-01651

PREDICTION OF FLOW HYDRAULICS FOR VEGETATED CHANNELS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01726

SEEDLING EMERGENCE AS RELATED TO TEMPERATURE AND MOISTURE TENSION,
Florida Univ., Quincy. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W79-01751

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01907

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

4D. Watershed Protection

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 236, Price codes: A04 in paper copy, A01 in microfiche. December 1972. 63 p. EPA-68-010-0704.

Descriptors: *Sediment control, *Erosion control, *Conferences, Sediments, State governments, Federal government, Legal aspects, Legislation, Organizations, Soil conservation.

The objective of this Conference was to help bring about recognition of a growing state and national concern about erosion prevention and sediment control, awareness of existing and proposed actions in this field by state and federal governments, consideration of the physical and organizational aspects of sediment control, consideration of the model legislation prepared under the auspices of the Council of State Governments, and development of a plan of action for sediment control by responsible leaders in Montana. (Humphreys-ISWS)
W79-01523

APPLICATION OF LANDSAT IMAGE WETLAND STUDY AND LAND CLASSIFICATION IN WEST TENNESSEE,
Tennessee University Space Inst. Tullahoma. Remote Sensing Div.
For primary bibliographic entry see Field 7B.
W79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WETLANDS IN WEST TENNESSEE,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W79-01639

SEEDLING EMERGENCE AS RELATED TO TEMPERATURE AND MOISTURE TENSION,
Florida Univ., Quincy. Dept. of Agronomy.
D. L. Wright, R. E. Blaser, and J. M. Woodruff.
Agronomy Journal, Vol. 70, No. 5, p 709-712, September-October, 1978. 1 fig, 1 tab, 16 ref.

Descriptors: Erosion control, *Grasses, Legumes, Highway beautification, *Germination, *Seeds, *Moisture tension, *Temperature.

To aid in selection of species for mixtures of seed for controlling erosion on newly constructed highway slopes, an experiment was designed to determine total emergence and rates of emergence of several grass and legume species and cultivars under various soil moisture and temperature regimes. The experimental observation suggested that the aggressive species of annual and perennial ryegrass, German millet, redtop, weeping lovegrass, and Abruzzi rye compete strongly with slower developing perennial grasses and legumes when seeded in the appropriate season. It was also observed that successful establishment of the intermediate species such as bluegrass, crownvetch, creeping red fescue, and Kentucky 31 tall fescue depends on cool temperatures and high moisture availability. Nonaggressive species of crownvetch and sericea also required high moisture and cool temperature, whereas common bermudagrass needed high moisture and warm temperatures. It was concluded that modification of seed mixtures should depend on the season of seeding and the type of vegetation desired, and that lower rates of aggressive species should be used while seeding mixtures of agressive species should be used while seeding mixtures of aggressive species with slow-developing species when conditions favor rapid emergence and growth for both. (Skogerboe-Colorado State)
W79-01751

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 2A.
W79-01899

FLUVIAL ADJUSTMENTS TO THE SPREAD OF TAMARISK IN THE COLORADO PLATEAU REGION,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W79-01919

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PROBLEMS IN AUTOMATING THE MONITORING OF SURFACE WATER CHEMISTRY,
Hydrochemical Inst., Novocherkassk (USSR).
V. B. Stradomskiy.
Soviet Hydrology: Selected Papers, Vol 15, No 4, p 288-299, 1976. 6 fig, 6 tab, 29 ref. Translated from Gidrokhimicheskiye Materialy, Vol 63, p 3-21, 1976.

Descriptors: *Water chemistry, *Surface waters, *Automation, *Instrumentation, Water pollution, Pollutants, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Suspended solids, Chemicals, Water quality, Rivers, Monitoring, Surveys, *USSR.

Modern equipment for determining the physical properties and chemical characteristics of water permits partial automation. In the future, most of the important characteristics that control surface water quality will be determined automatically using improved automation equipment and high-efficiency instruments, making it possible to measure the necessary water consumption characteristics directly in situ at the necessary point of a body of water. Automation of water quality monitoring involves the solution of at least three independent, but very closely related, problems: (1) the design principles of water quality monitoring and control systems; (2) instrumental methods and instruments for automated monitoring; and (3) mathematical base of the system (including cybernetic and physical simulation). An automated system would provide continuous monitoring of the chemical composition of surface water that varies rapidly in time and space on a new qualitative level, allowing water conservation planning. (Sims-ISWS)
W79-01507

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W79-01511

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
S. T. Crosmun.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-27709, Price codes: A06 in paper copy, A01 in microfiche. Ph D Dissertation, June 1977. 115 p 12 fig, 9 tab, 88 ref, 4 append.

Descriptors: *Polarographic analysis, *Heavy metals, *Water analysis, *Analytical techniques, *Trace elements, Instrumentation, Chemical analysis, Testing procedures, Cadmium, Toxicity, Lead, Pollutants, Zinc, Chromium, Water pollution, Analysis, *Pulse polarography, *Pulse anodic stripping, *Coulometric techniques, Uranium, Micro-analysis, Electrochemistry.

The use of a thin mercury film wax-impregnat graphite electrode for the simultaneous determin tion of cadium, lead, and zinc in an acetate buff by differential pulse anodic stripping voltammet was described. Optimal instrumental paramete for maximum resolution and sensitivity for simult neous analysis of these three elements in natu waters were discussed. The interference of copp with the determination of zinc was investigated detail. An optimal mercury film thickness for t electrode was suggested. A method utilizing diff ential pulse polarography for the determination chromium (VI) in natural water was describe Additions of 0.62 micrograms Cu(II)/ml and 0. micrograms Fe(III)/ml did not interfere with t determination of 0.050 micrograms Cr(VI)/m The natural water samples containing Cr(VI) we buffered to approximately pH 7 with 0.1 M amm nium acetate and 0.005 M ethlenediamine and an lyzed. Natural water samples of chromium fro 0.035 microgrms to 2.0 micrograms/ml may analyzed directly without further preparation. T detection limit is 0.010 micrograms/ml. A nov highly efficient cell with integral stirrer for co trolled potential coulometry was described. T cell was used to demonstrate the feasibility determining uranium (VI by predictive cou metry. A PDP 8/I minicomputer was used predict the coulometric endpoint with high accu cy within 2.5 minutes in a titration which norma takes about 10 minutes. This technique was sho to yield acceptable results even in the presence an interfering phosphate matrix. (Henley-ISW
W79-01517

MYCOFLORA OF ACTIVATED SEWA SLUDGE,
Auburn Univ., AL. Water Resources Resea Inst.
For primary bibliographic entry see Field 5E.
W79-01548

EXCHANGE OF CARBON DIOXIDE TWEEN THE ATMOSPHERE AND LAKE TARIO,
Canada Centre for Inland Waters, Burlington (O tario); and National Oceanic and Atmospheric A ministration, Ann Arbor, MI. Great Lakes En ronmental Research Lab.
For primary bibliographic entry see Field 2K.
W79-01550

BIOLOGICAL ASSESSMENT OF WAT QUALITY IN A LARGE RIVER SYSTEM: EVALUATION OF A METHOD FOR FISH
Virginia Polytechnic Inst. and State Univ., Blac burg. Dept. of Biology.
C. H. Hocutt, R. L. Kaesler, M. T. Masnik, and Cairn, Jr.
In: European Inland Fisheries Advisory Comm sion, Symposium on Methodology for the Surv Monitoring and Appraisal of Fishery Resource Lakes and Large Rivers. Symposium 55, Ma 1974. 20 p, 5 tab, 8 fig.

Descriptors: *Bioindicators, *Statistical meth *Analytical techniques, *Stress, *Water qua control, *Biological communities, Mathem studies, Water quality, Fish, Fresh water, *Jacc similarity coefficient, *Diversity index, Biolog assessment, Synthetic fibers, Virginia.

Fish have certain disadvantages and indicator stress conditions in aquatic systems. They mobile and can migrate to and from stressed a at will if not so drastically affected that moven is curtailed. Furthermore, data gathering may highly qualitative and not easily interpreted. public, however, more often focuses its atten on fish than other aquatic organisms and is fully satisfied about the health of an aquatic sys unless fish information is available. This study vides data on fish collected during the summ 1971 and 1972 from the New River is the vici of a synthetic fibers plat, Pearisburg, Virg These data were analyzed by two methods

onstrasted: the diversity index of Wilhm and Dorris and the Jaccard similarity coefficient. The ormer is a method currently used in monitoring quatic ecosystems and is a function of the numers and kinds of species found. The latter analyzes nly presence or absence of data at each station, nd provides a more critical method of analyzing ata. The Jaccard similarity coefficient is recomended as a method for the biological assessment f water quality. (EIS-Katz)
/79-01553

OSSIBLE CHANGES IN AEROSOL COMPOITION DUE TO DEPARTURE FROM EQUIIBRIUM CONDITIONS DURING SAMPLING,
wedish Water and Air Pollution Research Lab., oteborg.
. Brosset.
ublication No. B 454, July 1978. 28 p, 4 fig, 7 tab, ref.

escriptors: *Sampling, *Aerosols, *Equilibrium, Particle size, *Particulates, *Path of pollutants, Gases, *Air pollution, Fallout, Solubility, Methdology, Analytical techniques, Liquids, Pressure, quations, Acids, Volatility, Chemistry, Ammonia, itric acid, Hydrogen chloride, Water, Ammonin, Ions.

mple equations are presented which express the lationship at equilibrium between the partial essures of gaseous components (water, nitric id, hydrogen chloride, and ammonia) and the spective ion concentrations in the liquid phase ulfate, nitrate, chlorine, ammonium, and hydron). These equations can be used to show changes at may occur in the aerosol composition when ch a system is exposed to certain disturbances in nnection with particle sampling. All calculations owed that departure from équilibrium causes the lease of volatile components and transformation om the liquid phase to the gas phase. In some ses sampling total suspended matter and analyzg the gas passing through a filter is advantaous. Chemical properties of particles differ in lationship to the two main classes of size fracns, fine and coarse. Two such particle populaons were assumed to be in equilibrium with the s phase, then effects of changes in sampling were vestigated. Changes assessed were: (1) reduction ammonia concentration, and (2) reduction in ncentrations of acid gases (nitric acid and hydron chloride). Effects of changes in the water ntent of the system were analyzed, such as heatg the filter to keep particle samples dry, which sulted in a considerable percentage loss of nitric id and hydrogen chloride in fine particles and drogen ion and ammonium in coarse particles. ynch-Wisconsin)
79-01554

RUSES IN FINISHED WATER: THE OCCOJAN EXPERIENCE,
alth Effects Research Lab., Cincinnati, OH.
W. Akin, and W. Jakubowski.
vailable from the National Techical Information rvice, Springfield, VA 22161 as PB-266 316, ice codes: A02 in paper copy, A01 in microfiche. port No. EPA-600/J-76-044, 1976. In: Proceedgs AWWA Water Quality Technology Conferce, San Diego, California, December 5-8, 1976. 1-10, 5 tab, 8 ref.

escriptors: *Viruses, *Water pollution, *Public alth, *Water supply, Disinfection, Environmensanitation, Water pollution control, Evaluation, ater pollution sources, Investigations, Occoquan, boratory tests, Water sampling, Quality control.

investigation was carried out following reports detection of live poliovirus 1 in four samples of ished water collected from the Occoquan, Virnia, reservoir system. An evaluation of the coltion sites and other bacteriological data relating the reportedly contaminated samples indicated t the reservoir is an unlikely source of virus lution. Some of the reasons for this conclusion that chlorine concentration and pH levels at time were what is generally considered excelt for virus disinfection. Also, counts of cliform bacteria and other viruses were extremely low, indicating that the water was not heavily polluted with domestic waste. In addition, further studies on Occoquan water failed to detect a single virus. It is concluded that under the circumstances the detected viruses may be the result of exogenous contamination, such as laboratory handling. Some other occurrences of this type are described and the necessity for maintaining stringent laboratory procedures for preventing contamination is stressed. One source described is insufficient cleaning of laboratory apparatus after testing recovery systems using a seed virus. It is recommended that some kind of marker be included in the seed which is not present in naturally occuring virus. (Majtenyi-IPA)
W79-01577

DEVELOPMENT OF TECHNIQUE FOR DETECTION OF LOW MOLECULAR WEIGHT CONTAMINANT IN PRODUCT WATER FROM WATER PURIFICATION OR WATER REUSE SYSTEMS,
Amicon Corp., Lexington, MA.
T. W. Mix, and H. Scharen.
Available from the National Technical Information Service, Springfield, VA as ADA-038 148, Price codes: A05 in paper copy, A01 in microfiche. Final Comprehensive Report, August 1976. 88 p, 28 fig, 10 tab, 14 ref. DADA17-72-C-2169.

Descriptors: *Waste water treatment, *Monitoring, Colorimetry, *Water reuse, *Water purification, Reverse osmosis, Ozone, Permanganate, Spectrophotometry, Organic chemicals, Aldehydes, Water quality control, Technology.

A permanganate colorimeter was developed for detection of low molecular weight contaminants in waste water produced from water purification or water reuse systems. Main emphasis centered on monitoring quality of MUST product water which was processed through both reverse osmosis and ozonation. A permanganate colorimeter was selected for the following reasons: (1) the rate limiting step in ozonation of MUST reverse osmosis permeate appears to be ozonation of aldehydes, especially actaldehyde, which accumulate and represent and appreciable fraction of total organic carbon in the product water; (2) aldehydes are rapidly oxidized by basic permanganate solutions; (3) permanganate and manganate ions have high extinction coefficients and are rapidly detectable spectrophotometrically in low concentration; and (4) colorimetry is compatible with requirements for low cost, simplicty, reliability, durability, and portability. Also described are: a preliminary investigation of a spectrophotometer technique for the monitoring rate of decay of ozone as a measure of water purity; carbon adsorption experiments related to monitoring carbon column adsorption; and a preliminary study of monitoring combined reverse osmosis and ozonation as tertiary treatment for municipal treatment plant output. (Majtensyi-IPA)
W79-01578

MEASUREMENT OF TOTAL ORGANIC CONCENTRATION IN WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
E. Winkler.
NASA (National Aeronautics and Space Administration) TechBriefs, Vol. 3, No. 1, p 55, Spring, 1978. 2 fig.

Descriptors: *Water analysis, *Organic compounds, *Carbon, Wastes, Water pollution sources, Water pollution, Instrumentation, Ultraviolet radiation, Oxygen, Electrolysis, Water, Analytical techniques, Laboratory equipment, *Pollutant identification.

In a new continuous single-step process and instrument for determining the total organic carbon in water or waste water, the organic compounds, are oxidized to carbon dioxide by UV photolysis. The only required reagent, oxygen, is generated in situ by electrolysis of water. The apparatus is described and illustrated. (Brown-IPC)
W79-01600

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A057 074, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper Y-78-3, June 1978. 42 p, 10 tab, 1 append, 6 ref. Prepared in Environmental Laboratory, USAEWES.

Descriptors: *Water quality, *Evaluation, *Water analysis, *Kansas, Reservoirs, *Whitewater River(Kan), *Towanda Lake(Kan).

Investigated possible water-quality problems that may affect the realization of project benefits of proposed Towanda Lake--particularly the effects of total dissolved solids (TDS), chloride, and sulfate concentrations on water supply suitability. Because of high concentrations of these parameters, possible treatment processes were evaluated to alleviate potential water supply problems. The proposed impoundment would probably be well mixed, exhibiting weak, ephemeral stratification only during periods of calm weather. Therefore, a mass-balance routing of TDS, sulfates, and chlorides through the pool was performed. Results of the mass-balance routing indicated only minor problems should be expected with TDS levels and chloride and sulfate levels should remain below U.S. Environmental Protection Agency (EPA) criteria for these parameters. On the basis of this analysis, no special considerations in water treatment design are considered necessary for these parameters. Occasional algal blooms should be expected during periods of calm weather and this should be considered in the design of the water supply withdrawal system. Levels of fecal coliform bacteria in the headwaters of the reservoir should be expected to exceed EPA criteria following storm events, which may preclude the use of portions of the reservoir for primary contact recreation. (WES)
W79-01666

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Inst., MA.
For primary bibliographic entry see Field 5C.
W79-01691

IMPROVED TECHNIQUES FOR MARKING AND SAMPLING BAND-APPLIED FERTILIZERS AND PESTICIDES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, D. R. Keeney, D. B. Lesczynski, and L. M. Walsh.
Soil Science Society of America Journal, Vol. 42, No. 3, p 507-508, May-June, 1978. 1 fig, 1 tab, 10 ref.

Descriptors: Nitrification, Inhibitors, *Sampling, *Marking, Nitrogen compounds, *Fertilizers, *Pesticides.

Techniques for marking and sampling banded fertilizers were developed to estimate the rate of nitrification and the recovery of N from the band treated with a nitrification inhibitor. The band was marked by applying prilled elemental S at the point of fertilizer release. With this approach the band was easily detected many months after fertilizer application. The sampler was constructed of stainless steel and was 15 by 15 by 40 cm long. It was inserted into the soil above the previously located band and then removed and disassembled, and the soil subsectioned for a vertical profile of constituents in the band. The expanded dimensions of the sampler reduced sample variability, yet still allowed sufficient sampling efficiency to obtain adequate replication. These techniques provided more accurate estimates of nitrification and recovery of applied N and should find application in monitoring other fertilizers or pesticides on easily penetrated soils devoid of rocks. (Skogerboe-Colorado State)

W79-01709

DETERMINATION OF STABILITY CONSTANTS OF METAL-HUMIC ACID COMPLEXES BY POTENTIOMETRIC TITRATION AND ION-SELECTIVE ELECTRODES,
National Inst. for Environmental Studies, Yatabe (Japan). Water and Soil Environment Div.
T. Takamatsu, and T. Yoshida.
Soil Science, Vol. 125, No. 6, p 377-386, June, 1978. 8 fig, 4 tab, 19 ref, 14 equ.

Descriptors: *Heavy metals, *Humic acids, Electrodes, Pollutants, Copper, Cadmium, Lead, *Volumetric analysis.

A new technique based on the combined use of potentiometric titration and ion-selective electrodes was proposed for determining apparent stability constants (successive stability constants and overall stability constants) of divalent metal cation ($Cu(++)$, $Pb(++)$, and $Cd(++)$ complexes with humic acids. Fourteen humic acids from diverse sources, including humidified rice straw, were examined. The stability constants increased with an increase in pH, and the order of values obtained was $Cu(++) > Pb(++) >> Cd(++)$. The overall logarithmic stability constants with the soil humic acid examined were 8.65 for $Cu(++)$, 8.35 for $Pb(++)$, and 6.25 for $Cd(++)$ at pH 5.0. The overall stability constants of $Cd(++)$ complexes ranged from 430000 to 4.6 times 10 to the 7th power at pH 6.0. The overall stability constants increased with increasing humification in the higher humification range, and the values correspond to the contents of very weakly acidic functional groups. The binding mechanisms of the metal cation complexes with humic acids seemed to accompany the coordinate bonds of undissociated very weakly acidic functional groups, in addition to the ionic bonds through COOH and/or OH groups. (Skogerboe-Colorado State)
W79-01721

STUDY OF WATER TREATMENT EFFECTS ON ORGANIC VOLATILES IN DRINKING WATER,
Alabama Univ., University. Dept. of Chemistry.
For primary bibliographic entry see Field 5F.
W79-01722

METHOD FOR ADENOSINE 5'-TRIPHOSPHATE MEASUREMENT ON COKE WASTE ACTIVATED SLUDGE,
Alabama Univ. in Birmingham, Dept. of Biology.
For primary bibliographic entry see Field 5D.
W79-01723

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
Y. T. Chien, and T. J. Killeen.
In: Workshop on Pattern Recognition Applied to Oil Identification, November 11-12, 1976, Coronado, California, Institute of Electrical and Electronics Engineers Computer Society, IEEE Cat. No. 76CH1247-6C, p. 15-33. 12 fig, 14 ref. OWRT A-060-CONN(4), 14-31-0001-6007.

Descriptors: *Oil spills, *Computer programs, *Pollutant identification, Wate quality control, Waste identification, Oil pollution, Oil wastes, *Interactive computer systems, *Patterns recognition, *Pictorial information processor, Discrete waveforms, Thin-layer chromatography.

A brief review of pattern recognition technology as applied to oil spill identification is presented in this paper. Two computer-based systems that are potentially useful for oil spill identification are described. The first is an interactive graphics system which is most suitable for manipulating discrete wave-forms (such as FL or IR Spectra), with the aid of graphical display. The other system is a general 2-dimensional pictorial information processor, which is potentially useful for identifying oil images such as those produced by the TLC technique.
W79-01747

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS - OR DID THE REAL SPILLER GET AWAY.,
Connecticut Univ., Storrs. Dept. of Statistics.
T. J. Killeen, and Y. T. Chien.
In: Workshop on Pattern Recognition Applied to Oil Identification, November 11-12, 1976, Coronado, California, Institute of Electrical and Electronics Engineers Computer Society, IEEE Cat. No. 76CH1247-6C, p. 66-72. 1 fig, 2 tab, 2 ref. OWRT A-060-CONN(3), 14-31-0001-6007.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, *Mathematical models, Model studies, Waste identification, Oil pollution, Oil wastes, *Probability model, *Chemical spectra, Weathering effects.

Severa techniques are used to 'fingerprint' oil by means of chemical spectra. Spectral changes which occur due to weathering are difficult to predict and may invalidate the results. Accurate simulation of weathering conditions is not possible, and weathering changes may be drastically different even for similar oils. Identification of the true spiller through visual examination of spectra is therefore not guaranteed even when all suspects and spill areas have been adequately sampled. A method of revising the probability of the guilt of suspects in an oil spill case has been developed. This technique utilizes the information contained in spectra obtained from suspects and spill samples. It also considers the possibility that the true spiller escaped without being sampled.
W79-01748

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON CADMIUM,
National Environmental Research Center, Research Triangle Park, NC.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-246 820, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Star Series, EPA-600/6-75-003, 72 p, March 1975. 5 fig, 27 tab, 78 ref.

Descriptors: *Cadmium, *Toxicity, Public health, Human pathology, Path of pollutants, Metals, Chemical analysis, Water analysis, Water quality, Chemical properties, Environmental effects, Air pollution, Animal pathology, *Bioaccumulation, *Tissue analysis, *Carcinogens.

This report is a review and evaluation of the current knowledge of cadmium in the ienvironment as related to possible deleterious effects on human health and welfare. Sources, distribution, measurement, and control technology are also considered. Cadmium is widely distributed in the environment. The human body burden of cadmium is cumulative. The half-time of cadmium in man is estimated at over 10 years. Man's primary exposure is from food, tobacco smoke, water, and ambient air. Food and tobacco smoke are the major sources except in the immediate vicinity of major sources of atmospheric emissions of cadmium. Emphysema and other lung diseases have been related to industrial exposure to airborne cadmium compounds. Kidney damage has also resulted from long-term exposure to cadmium. Animal experiments link anemia, hypertension, testicular necrosis, and carcinogesis with cadmium exposure. Current knowledge of the dose-response relationship does not provide criteria on which to base standards. (EIS-Deal)
W79-01756

DETERMINATION OF POLYCHLORINATED BIPHENYLS IN PAPER MILL EFFLUENTS - THE INFLUENCE OF SUSPENDED SOLIDS,
Institute of Paper Chemistry, Appleton, WI.
D. B. Easty, and B. A. Wabers.
Tappi, Vol. 61, No. 10, p 71-74, October, 1978. 8 tab, 6 ref.

Descriptors: *Pulp wastes, *Aroclors, *Polychlorinated biphenyls, *Industrial wastes, *Analytical techniques, Solvent extractions, Surfactants, Fibers(Plant), Gas chromatography, Pollutant identification, Effluents, Water analysis, Chemical wastes, Waste water disposal.

Aroclor 1242, a toxic mixture of polychlorinated biphenyls (PCB) previously used in carbonless copy paper, is still apparent in pulp mill products effluents, and sludges because of the use of recycled fiber. Studies were performed to evaluate the EPA'S methodology for analyzing PCB's in paper mill effluents and process streams containing suspended solids. Chemical analyses involved liquid-liquid extraction, Florisil cleanup, and electron gas capture chromatograpy. The evaluatio focused on the retention of PCB's by hardwood and softwood fiber suspensions during separatory funnel extraction. The studies demonstrated that a two-step procedure was required for complete removal of Aroclor 1242 from suspensions of Cellulose fibers. The recommended procedure incorporated triple separatory funnel extraction followed by alcoholic KOH reflux of the isolated fibers. The EPA procedure was concluded to be adequate for mill effluents containing low amounts of suspended solids. The alcoholic KOH reflux stage was considered necessary to counteract that PCB sorption which was controlled by the fiber-specific surface area and resin content of the fiber suspensions. The presence of starches and pigments, with the possible exception of clay and talc, did not interfere with the two-step extraction procedure. (Schul, FIRL)
W79-01771

SHORT-TERM VARIATION OF THE CHEMICAL COMPOSITION OF THE NIAGARA RIVER,
Department of the Environmental, Burlington (Ontario). Water Quality Div.
C. H. Chan, and A. H. Clignett.
Fisheries and Environment Canada, Scientific Series No. 90, 1978, 35 p, 13 tab, 9 fig, 2 appen

Descriptors: *Water quality control, *Water quality, *Statistical methods, Water pollution, Pollutant identification, Water pollution sources, Phosphorus, Nitrogen, Nutrients, Ions, Chemical reactions, Ammonia, Chloride, Time series analysis, *Lake Ontario, *Niagara River, Pollution level

This report lists results of a daily sampling program at Niagra-on-the-Lake to obtain refined loading estimates of phosphorus, nitrogen and major ions into Lake Ontario from the Niagara River. The accuracy of the daily data within a week measured against data collected at hourly intervals. Samples were collected from an automatic water sampler. Four 7-day periods for each season were chosen to evaluate the variabilities in water quality. Summary statistical tables of hourly samples for nutrients and major ions for the 4 time periods are presented. Results show a significant and large seasonal variation in the chemical composition of the water. Charts showing a power spectral analysis on cyclic behavior in nutrient variables are presented. No significant diurnal variations were detected. Tables are included of daily mean concentrations of nutrients and major ions and the expected deviations from these mean concentrations. With the exception of ammonia, the concentration frequency distribution of each parameter measured within a week assumes a normal distribution. Thus, fewer water samples would give comparable results without losing too much accuracy saving time and money. (Coan-NC)
W79-01831

APPARATUS FOR THE CONTINUOUS MEASUREMENT OF THE CONCENTRATION OF OIL,
Horiba, Ltd., Kyoto (Japan). (Assignee).
M. Iwamoto, and T. Nomura.
U.S. Patent No. 4,103,162, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, V 972, No 4, p 1722, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution sources, Analytical techniques, Pollutant identification, Infra-red absorption techniques.

An apparatus for continuously measuring the concentration of oil in a water sample by the infra-red absorption method is described. The measuring response of the apparatus is rapid as opposed to previous devices and the accuracy in measuring the oil content is sufficiently accurate. The apparatus comprises a supply device which supplies an oil-containing water sample and another supplying device which supplies a solvent for extracting the oil in the sample in a controlled and continuous amount. An extractor connected to the supplying device has an agitator and receives the oil-containing water sample and solvent and serves to extract the oil component in the water sample with the solvent. (Sinha-OEIS)
W79-01867

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
J. L. Stach, R. N. Helgerson, R. F. Bretz, M. J. Tipton, and D. R. Beissel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 374, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Institute, South Dakota State University, Brookings, Completion Report. July 1978. 42 p, 12 fig, 11 tab, 15 ref. OWRT A-054-SDAK(1), 14-34-0001-6043.

Descriptors: Observation wells, Recharge, Mine tailings, *Selenium, Pierre shale, *South Dakota, Arsenic, Surface water, Groundwater, Whitewood Creek(SD), Belle Fourche River(SD), Cheyenne River(SD), Trace elements, *Pollutant identification, Water analysis.

As a result of 100 years of gold mining activity in the northern Black Hills, the waters of Whitewood Creek, Belle Fourche River, and Cheyenne River have anomalous trace element contents. The emphasis of this study was analysis of the arsenic content of ground and surface waters; selected samples were analyzed for selenium. A total of 81 ground-water sampling sites were established; of these, 39 were installed plastic-cased observation wells with the remainder private wells. The arsenic content of 243 samples range from less than 2.5 parts per billion (ppb) to 2000 ppb. Of the 81 sampling sites, water from 14 sites exceeded the drinking water standard of 50 ppb one or more times. Twelve of these sites were located along Whitewood Creek, one along the Belle Fourche River and one along the Cheyenne River. The high arsenic level found in the ground water along Whitewood Creek is thought to result from direct discharge by the creek and/or bacterial oxidation and leaching of the mine tailings deposited on the floodplain. Which mechanism or combination prevails is dependent on the specific site. Selenium analyses were performed on 64 samples. The range was from 0.0 ppb to 3.0 ppb with 12 of the samples exceeding the drinking water standard of 10 ppb. The high selenium values were associated with water wells developed in or near the Pierre shale. The natural background source of the selenium is the shale. (Wiersma-South Dakota)
W79-01897

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01907

DEVELOPMENT OF A NEW TECHNIQUE FOR THE ANALYSIS OF PESTICIDES IN WATER,
Kentucky Water Resources Research, Inst., Lexington.
P. K. Kadaba, P. K. Bhagat, R. Osredkar, and V. R. K. Murthy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 370, Price codes: A04 in paper copy, A01 in microfiche. Research Report No 116, 1978. 59 p, 20 fig, 2 tab, 19 ref. OWRT A-065-KY(1). 14-34-0001-6018. 14-34-0001-7037.

Descriptors: *Spectroscopy, Spectrometers, *Trace elements, Pesticides, Organic compounds, Carbamate pesticides, *Pollutant identification, Analytical techniques, Water analysis, *Pesticide residues, *Spectrophotometry, Nuclear Double Resonance Spectrograph, Electronic structure of molecules, Molecular structure.

A Nuclear Double Resonance Spectrograph has been designed and constructed with emphasis on quadrupolar nuclei of half-integral spins. The use of a data acquisition and processing system featuring the A/D converter, signal averager with built in fast Fourier transformation hardware greatly improves the S/N ratio. The spectrograph has been used to detect certain organochlorine, carbamate and symmetrical triazine pesticides. Concentration levels that can be detected range from 15 to 100 micrograms per liter. Since the measurements are done below ice temperatures, heat-liable compounds can be detected without conversion to more suitable derivatives as in gas chromatography. Fats and oils in sample extracts do not interfere with the measurements. Further improvement in sensitivity is possible by using liquid nitrogen-cooled, ferrite-cored electromagnet, by increasing the polarizing field and by reducing receiver recovery time. In addition to analysis of pesticides, the Nuclear Double Resonance technique can be used to study the electronic structure of molecules.
W79-01981

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

MEASUREMENTS OF PHYTOPLANKTON-PROTEIN CONTENT WITH THE HEATED BIURET-FOLIN ASSAY,
USV Pharmaceutical Corp., Tuckahoe, NY.
T. E. Dorsey, P. McDonald, and O. A. Roels.
Journal of Phycology, Vol. 14, No. 2, p 167-171, 1978. 3 fig, 2 tab, 19 ref. Sea Grant 04-5-158-59.

Descriptors: *Proteins, *Phytoplankton, *Heated biuret-folin method, *Plant growth, *Assay, *Measurement, Algae, Methodology, Analytical techniques, Spectrophotometry, Indicators, Filtration, Nitrogen, Particulates, *Bioassay.

The heated biuret-folin protein assay is shown to be applicable to assays of algal protein in several freshwater and marine phytoplankton species, and is considered a good quantitative measure of algal growth. In this method, a filter containing the algal sample is placed in the bottom of a test tube, 5 ml biuret reagent added (slightly modified to accomodate additional chelating agent), and the contents heated at 100C for 100 minutes before addition of Folin-phenol. The tube is then centrifuged to remove the filter, and the molybdate blue clor measured with a spectrophotometer at 660 nm and compared with identically treated standards. This method consistently measures 90% of the total nitrogen of filtered algal samples as protein-nitrogen without the need of mechanical disruption; data indicate the method measured total protein on all species tested and for naturally occurring mixtures of algae and detritus. Dilute algal suspensions with as little as 0.05 microgram-atom particulate protein-nitrogen/liter can be concentrated by filtration on glass fiber filters to the optimum 1.0 microgram-atom particulate protein-nitrogen per filter. Other assays of algal protein content, including those of Price and of Packard and Dortch, are unsatisfactory for algal species which are difficult to break. Current methods of growth measurement lack the rigid quantification of this method, which is both quantitative and chemically specific. (Lynch-Wisconsin)
W79-01995

5B. Sources Of Pollution

APPLICATION IN THE WATER INDUSTRY OF REGIONAL GEOCHEMICAL MAPS OF ENGLAND AND WALES,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
I. Thornton, and J. S. Webb.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 1, p 11-25, January 1977. 6 fig, 4 tab, 26 ref.

Descriptors: *Water pollution sources, *Water quality, *Sediments, *Surveys, Metals, Streambeds, Geochemistry, Estuaries, Water pollution, Lead, Maps, Data collections, Areal, Cadmium, Spatial distribution, Arsenic, Copper, Zinc, Streams, Rivers, Foreign countries, *England, *Wales.

Regional geochemical maps of England and Wales have focussed attention on a number of metal-rich areas related to contamination from past base-metal mining and smelting, present-day industrial activity, urbanization, and natural geochemically-anomalous source rocks. Detailed sampling in the soft water environment of southwest England demonstrated an encouraging degree of correlation between metals in sediments and waters and served to confirm the thesis that a knowledge of the chemical composition of stream sediment can prove useful in the prediction of sites where, under certain conditions of rainfall and runoff, the metal load in associated waters may exceed recommended limits. Thus, in certain cases, the sediment may prove a more stable indication of potential metal excess than one-off sampling of the waters themselves. If this is widely true, the geochemical atlas of England and Wales, based on the multi-element analysis of tributary drainage sediments, may be applied usefully by the Water Industry to assist in the selection of key sites for water monitoring programs to help identify those trace elements or metals that require monitoring. The regional geochemical maps constitute a unique source of baseline data, which, it is hoped, will assist in present-day and future assessment of water resources. The atlas has drawn attention to several estuaries where contaminated input drainage has led to a marked enhancement of metals in sediments and waters, which in turn can affect the potential use of estuaries and their waters for shellfish culture. (Humphreys-ISWS)
W79-01501

THE 1976 DROUGHT AND NITRATE LEVELS IN THE RIVER EXE BASIN,
Exeter Univ. (England). Dept. of Geography.
D. E. Walling, and I. D. L. Foster.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 4, p 341-352, July 1978. 6 fig, 3 tab, 19 ref.

Descriptors: *Water quality, *Watersheds(Basins), *Nitrates, *On-site data collections, Droughts, Data collection, Sampling, Analysis, Magnesium, Streamflow, Rainfall, Seasonal, Autumn, Monitoring, Rivers, Foreign countries, Foreign research, *England, *River Exe(England).

The existence of a water quality sampling network within the catchment of the river Exe, in Devon, has provided an apportunity to assess the impact of the 1976 drought and subsequent autumn rainfall on nitrate levels in stream flow. Comparisons were made with data from previous years. Analysis of data collected at different sampling frequencies indicated that the 1976 drought produced a unique pattern of nitrate behavior. Concentrations increased rapidly during the onset of the post-drought rainfall, and levels recorded subsequently

included one case which was over 45 times higher than those previously encountered at that time of year. Concentrations of up to 903.6 mg/l (NO3-N) were recorded at the outlet of a tile drain system. It was suggested that the marked increase in nitrate levels can be related to the influence of the extreme drought conditions on mineralization and nitrification processes within the soil. The Exe basin covers a drainage area of 1,462 sq km and includes a diversity of rock types, ranging from the indurated slates and grits of the Devonian, through the shales and sandstones of the Carboniferous, to the marls, sandstones, and breccias of the Permian and Trias. Mean annual precipitation and runoff vary from over 1,800 mm and 1,500 mm, respectively, in the northern upland area of Exmoor, to less than 800 mm and 300 mm in the lowland area at the head of Exe estuary. Land use varies across the area, with mixed farming characteristizing the lowlands underlain by Permian and Triassic strata, permanent pasture predominating on the Carboniferous outcrop, and the appearance of some moorland on the higher areas of Exmoor. (Humphreys-ISWS)
W79-01504

'THERMAL POLLUTION' OF BODIES OF WATER AND THE HYDROLOGIC ASPECTS OF THE PROBLEM,
T. N. Filatova, M. R. Tsippert, I. A. Zair-Bek, V. A. Misyuk, and V. P. Molitvina.
Soviet Hydrology: Selected Papers, Vol 15, No 4, p 257-264, 1976. 5 fig, 5 tab, 17 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 231, p 163-180, 1976.

Descriptors: *Lakes, *Water temperature, *Water pollution sources, *Thermal pollution, Foreign research, Hydrologic aspects, Heated water, Reservoirs, Data collections, Foreign countries, Evaluation, Probability, *USSR.

The planned large-scale development of thermal power engineering threatens bodies of water with so-called thermal pollution because of the discharge into them of waters as 8-12C from the heat exchangers of thermal and nuclear power plants or coolers of industrial enterprises. In the Soviet Union, heated waters are discharged into special reservoirs, multipurpose reservoirs, and lakes. By using statistical methods of computation and generalized water temperature data, the limits of temperature variation and the probability of occurrence of temperatures of a given value can be found. The natural water temperature t was computed for several Russian lakes and reservoirs and was presented in graphs and tables. (Humphreys-ISWS)
W79-01505

THE ADSORPTION OF CHROMIUM (VI) AT THE OXIDE/WATER INTERFACE,
Air Force Civil Engineering Center, Kirtland AFB, NM.
M. G. MacNaughton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 083, Price codes: A03 in paper copy, A01 in microfiche. Report No. AFCEC-TR-75-17, September 1975. 27 p, 8 fig, 2 tab, 34 ref.

Descriptors: *Chromium, *Chemical properties, *Water chemistry, *Water pollution, *Geochemistry, Metals, Chemistry, Trace elements, Chemical wastes, Pollutants, Public health, Water quality, Model studies, Adsorption, Mathematical models, Toxicity, Phosphates, Heavy metals, *Chromium compounds.

Because of its toxicity, chromium has a potential environmental impact, and it is imperative that mechanisms which control the movement of this meta through the environment be known. It has been documented that adsorption to suspended and deposited materials is important in controlling the concentration of heavy metals in natural waters. Numerous previous investigators have been concerned with the adsorption of hydrolyzable heavy metals; however, chromium exists in aqueous solution as the anionic oxocomplex. In this report, data on adsorption of chromium and phosphate were compared at the water interface of various metal oxides. The conclusions of this investigation were: (1) for A1203, both chromium and phosphate adsorb at low pH's; however, upon increasing pH, there is a decrease in the percentage adsorption; (2) chromium adsorption decreases with increasing ionic strength; (3) phosphate exhibits a higher specific adsorption energy than does chromium; (4) adsorption of both chromium and phosphate is low for solids which have isoelectric points at low pH's; and (5) with a more valid method of determining the surface potential other than the Nernst equation, the simple electrical double layer model can be used to give reasonable predictions of the pH and surface charge response for adsorption of anions. (Henley-ISWS)
W79-01514

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
R. C. Arnett, R. A. Deju, R. W. Nelson, C. R. Cole, and R. E. Gephart.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-140, Price codes: A06 in paper copy, A01 in microfiche. Report ARH-ST-140, October 1976. 109 p, 13 fig, 1 tab, 58 ref, 1 append. ERDA E(45-1)-2130.

Descriptors: *Groundwater movement, *Water pollution, *Model studies, *Mathematical models, *Columbia River, *Washington, Pollutants, Path of pollutants, Radioactive wastes, Groundwater, Radioactive waste disposal, Computer models, Computer programs, Flow, Geology, *Hanford Atomic Reservation(Wash).

Disposal of radioactive wastes to surface disposal sites at the Hanford Atomic Reservation has resulted in some radioactive and chemical contamination of the underlying groundwater flow systems. In support of the Hanford groundwater management effort, a preliminary conceptual model of the groundwater system was formulated as a first step in understanding possible contaminant movement. The mathematical modeling capabilities needed for better understanding and prediction of such contaminant movement were discussed in this paper; and the state-of-the-art in groundwater modeling as related to Hanford was summarized, with emphasis upon computer solution methods. An inventory of potentially applicable codes available both at Hanford and elsewhere was included. The areas where groundwater modeling capability is lacking were outlined, and the steps needed to overcome such deficiencies were discussed. (Sims-ISWS)
W79-01522

THREE-DIMENSIONAL FLOW SIMULATION IN ESTUARIES,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W79-01524

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
J. M. Darr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 231, Price codes: A06 in paper copy, A01 in microfiche. M.A. Thesis, May 1978. 113 p, 28 fig, 17 tab, 60 ref. OWRT A-086-MO(2). 14-34-0001-6026. 7053 and 7054.

Descriptors: *Groundwater, *Water quality, *Brackish water, *Geochemistry, *Missouri, Calcite, Dolomite, Hydrogen ion concentration, Aquifers, Water pollution, Groundwater resources, Water utilization, Groundwater movement, Sampling, Wells, Saline water intrusion, Water table aquifers, Water table, Potable water.

The geochemical and microbiological characteristics of the groundwater in Bates, Vernon, and Barton Counties in southwestern Missouri were investigated in relation to problems involving invasion of aquifers by brackish water. Minerology of Pennsylvania sandstones and limestones in the area were determined by standard methods and water samples were obtained from 70 farm and municipal water supply wells. Analysis of the groundwater data revealed the presence of a northwest-southeast trending salinity gradient, with water in northwest and central parts of the area unsuitable for human consumption. Bacteriological analysis detected sulfate reducing bacteria. Mineral studies showed that water is in equilibrium with calcite and dolomite and suggest that the presence of ferrous iron enhances stability of dolomite relative to calcite. The relationships between dissolved sodium, potassium, magnesium, silica, and pH indicate that the water is in equilibrium with albite, potash feldspar, quartz and illite but not kaolinite. Relationships between dissolved sulfur, carbon, iron, pH, and pE indicate that the groundwater is not a redox equilibrium. The rates amd migration patterns of brackish water established from records from 1966-1975 indicate that movement of selected isochlors is intruding the area along an east-southeast trends, probably in response to regionally reduced water levels resulting from groundwater withdrawal. Further use of groundwater resources in this region by increased industrialization would increase rate of salt water intrusion and the size of area affected. (Majtenyi-IPA)
W79-01535

PREDICTING THE ANAEROBIC DEGRADATION OF ORGANIC CHEMICAL POLLUTANTS IN WASTE WATER TREATMENT PLANTS FROM THEIR ELECTROCHEMICAL REDUCTION BEHAVIOR,
Montana State Univ., Bozeman. Dept. of Chemistry.
R. D. Geer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 224, Price codes: A04 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 95, Montana State University, Bozeman, July 1978. 61 p, 34 fig, 3 tab, 19 ref, 4 append. OWRT A-097-MONT(1). 14-34-0001-7055.

Descriptors: *Anaerobic digestion, *Organic wastes, *Oxidation-reduction potential, *Reduction(Chemical), Waste treatment, Sludge digestion, Electrochemistry, Degradation, Alkylhalides, Aromatic nitro compounds, Iron porphyrins, Rate constants, Methoxychlor, Bifenox, Mirex, Tetrachloronitrobenzene.

The results of this study show the rather general and simple hypothesis, that the redox potential of an organic pollutant along controls its ability to degrade anaerobically, to be incorrect. The results support the concept that reduced iron porphyrins in anaerobic systems mediate the degradation of some specific types of organic compounds. Good data on the rate of degradation of four compounds in sewage sludge were obtained. The rate constants for the alkyl halide types were Mirex, -0.0008 hr-1 and Methoxychlor, -0.40 hr-1. The aromatic nitro containing compounds had rate constants of -0.53 hr-1 for 2,3,5,6-tetrachloronitrobenzene and -0.26 hr-1 for Bifenox. The nitro compounds were reduced to corresponding anilines and did not lose aromatic chlorines. The alkyl halide compounds had a chlorine replaced with a hydrogen. The other types of compounds did not appear to degrade under the experimental conditions. The redox potential of the anaerobic system was important in determining how its degradation proceeds. The tetrachloronitrobenzene did not react if the redox potential of the sludge was less negative than -0.38 volts relative to an SCE electrode. (Hunt-Montana)
W79-01539

HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA,
Montana Coll. of Mineral Sciences and Technology, Butte.
W. A. Van Voast, R. B. Hedges, and J. J. McDermott.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 223, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 94, Montana State University, Bozeman, June 1978. 34 p, 9 fig, 4 tab, 13 ref. OWRT A-077-MONT(1). 14-31-0001-4026.

Descriptors: *Aquifer testing, *Transmissivity, *Hydraulic conductivity, *Spoil banks, *Strip-mines, Coal mine wastes, Groundwater, Water quality, Salts, Trace elements, *Montana, Colstrip(Mont), Sarpy Creek(Mont), Decker(Mont), Ft Union, Powder River, Tongue River, Rosebud mine, Big Sky mine.

Coal beds provide water as well as energy because of their generally fractured character. Hydraulic conductivities of saturated spoils are more diverse than those of the undisturbed coal beds but have comparable average values. Aquifer development in mine spoils is greatest near the bases of the spoils where coarse rubble and wasted coal accumulate. Median concentrations of dissolved solids (major constituents) and of some trace elements are higher in waters from mine spoils than in waters from coal beds. The potential for increased dissolved solids is considered the most significant. The data base of spoils' hydraulic conductivities and water qualities developed in this study will be used for development of predictive techniques for application to future mine area. (Hunt-Montana)
W79-01542

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

METAL CONCENTRATIONS (AS, CD, CU, PB AND ZN) IN SHORTHORN SCULPINS, MYOXOCEPHALUS SCORPIUS (LINNAEUS) AND ARCTIC CHAR, SALVELINUS ALPINUS (LINNAEUS), FROM THE VICINITY OF STRATHCONA SOUND, NORTHWEST TERRITORIES,
British Columbia Research Council, Vancouver.
A. Bohn, and B. W. Fallis.
Water Research, Vol. 12, p 659-663, 1978. 2 fig, 2 tab, 9 ref.

Descriptors: *Metals, *Sculpins, *Cadmium, *Copper, *Lead, *Zinc, Fish physiology, Animal metabolism, Path of pollutants, Size, Standards, Marine fish, Industrial wastes, Canada, Arctic, *Arsenic, *Tissue analysis, *Arctic char, Strathcona Sound, Shorthorn sculpins.

Concentrations of arsenic, cadmium, copper, lead, and zinc were determined in muscle and liver tissues from shorthorn sculpins and landlocked Arctic char collected in the vicinity of Strathcona Sound, N.W.T., prior to industrial activity. The concentration of arsenic in both muscle and liver tissue from shorthorn sculpins displayed a positive correlation to body weight over the entire size range, and substantially exceeded the maximum recommended level for arsenic in marine animal products established by the Canadian Food and Drug Directorate. The concentrations of the other four elements were either not correlated to body weight or else the data were non-linear. No correlation between the metal concentrations and body weight was found in Arctic char. (EIS-Deal)
W79-01552

POSSIBLE CHANGES IN AEROSOL COMPOSITION DUE TO DEPARTURE FROM EQUILIBRIUM CONDITIONS DURING SAMPLING,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-01554

STUDIES ON THE DECOMPOSITION OF ALLOCHTHONOUS DETRITUS IN TWO SOUTHERN CALIFORNIA STREAMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
S. D. Hart, and R. P. Howmiller.
Verh. Internat. Verein. Limnol. 19 Stuttgart, November 1975, p. 1665-1674. 6 fig, 10 ref. (California Water Resources Center Project UCAL-WRC-W-492). OWRT A-055-CAL(2).

Descriptors: *Detritus, *Decomposing organic matter, *Streams, Leaves, *California, Water pollution sources, Goleta(Calif), Santa Barbara(Calif).

It is clear from numerous studies that the ecosystems of most undisturbed streams, and to a greater or lesser degree, those of disturbed streams as well, depend upon detritus of terrestrial origin as the primary source of biological energy. Often tree leaves, in relatively intact condition, are an important component of the allochthonous detritus. While a number of investigators have attempted to measur the amount of tree leaves entering streams and the rate of decomposition of leaves within the streams, only a few have considered the question of difference between leaves of various tree species in rate of decomposition and utilization by the stream biota. There has similarly been little effort to compare rates of decomposition of leaves in different streams. This paper discusses the results of a study comparing rates of decompostion of leaves of locally important trees in two southern California streams. (Snyder-Calif, Davis)
W79-01588

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX A: IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01597

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A) APPENDIX B: THE INFLUENCE OF COLLOIDAL ORGANIC MATTER (COM) UPON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01598

APPLICATION OF GEOTECHNICAL THEORIES TO THE LANDFILL DISPOSAL OF PAPERMILL SLUDGES,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W79-01620

A STUDY OF LEACHATE FROM DREDGED MATERIAL IN UPLAND AREAS AND/OR IN PRODUCTIVE USES,
SCS Engineers, Long Beach, CA.
J. L. Mang, R. J. Lofy, J. C. S. Lu, and R. P. Stearns.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 897, Price codes: A20 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-20, June 1978. 435 p, 1 apend, 99 tab, 52 fig, 159 ref.

Descriptors: *Leachate, *Leaching, *Lysimeters, *Dredged material, *Containment areas, *Waste disposal sites.

A laboratory lysimeter study was conducted to determine the composition of subsurface leachates generated from each of five differnet dredged materials, each combined with one of two different subsurface soil profiles. Sixteen 30-cm-diam Plexiglas lysimeter columns were consecutively filled with equal depths of homogeneous, oxidized native soil and anoxic dredged material (total profile of 60 cm). The dredged materials were obtained from various land disposal areas. The primary leaching solution was distilled water (rainwater leach). Other leaching fluids consisted of distilled water acidified to pH 4.5 with sulfur dioxide, hard water buffered with bicarbonate, and leaching fluids containing high organic contents. Results indicate that leachate quality may be governed by both the dredged material and underlying soil. The leachates (interstitial water) from the dredged material tended to show slight time-dependent increases in pH, Eh, total organic carbon, alkalinity, and manganese. Concentrations of soluble total phosphorus, orthophosphate phosphorus, and magnesium remained relatively stable, while soluble organic and ammonium nitrogen, copper, calcium, sodium, and potassium showed continual decreaes in concentration. Cadmium and zinc trends were highly variable during the course of the leaching tests. Chlorinated trends were highly variable during the course of the leaching testes. Chlorinated hydrocarbons (PCB's and chlorinated pesticides) were generally at undetectable levels. (WES)
W79-01660

FEEDLOT POLLUTION: A SOLVABLE PROBLEM.
South Dakota Farm and Home Research, Vol 21, No 2, p 30-31, Spring, 1970.

Descriptors: *Agricultural runoff, *Water pollution, *South Dakota, *Feedlots, Land management, Precipitation(Atmospheric), *Farm wastes, Retention ponds.

While he was a civil engineering graduate student at South Dakota State University, Paul Thormodsgard did research on snow and rainfall runoff from certain feedlots. He deducted that good land management could be a more feasible answer to feedlot pollution than expensive waste treatment. He found that a large ditch and a plowed field between the feedlot and a stream diminished the waste runoff. He also suggested that waste introduced into a stream in times of flood may be diluted by the large amounts of water. Thormodsgard pointed out that feedlot runoff is related to type of precipitation and could be held in retention ponds or possibly in a plowed field until conditions are right for its release. (Sanders-East Central)
W79-01671

SOURCES OF HEAVY METALS IN SEDIMENTS OF THE HUDSON RIVER ESTUARY,
Lamong-Doherty Geological Observatory, Palisades, NY.
S. C. Williams, H. J. Simpson, C. R. Olsen, and R. F. Bopp.
Marine Chemistry, Vol 6, No 3, May 1978, p 195-213, 5 fig, 7 tab, 32 ref.

Descriptors: Environmental effects, *Water pollution sources, Sediments, Estuaries, *Hudson River, Deposition(Sediments), *Heavy metals, Zinc, Copper, Lead, Cesium, Manganese.

Zinc, copper and lead in Hudson River sediments are from three general sources of comparable magnitude; preindustrial natural sources of weathering; diffuse recent contamination throughout the estuary; and sewage, industrial effluent and urban runoff. The distribution of Cs137 corresponds with that of sediments with recent metal contamination, and provides a good indication of the pattern of pollutant metal accumulation. The depth to which pollutant metals are found in Hudson sediments is similar to the depth distribution of Cs137. Amounts of Fe in Hudson estuary sediments was reasonably constant, but Mn concentration varied over an order of magnitude with greater values near the surface in low-salinity and fresh-water areas. Pollutant copper added to the harbor appears to be rapidly deposited in the sediments. (Chilton-ORNL)
W79-01678

BACTERIAL AEROSOLS FROM COOLING TOWERS,
Army Dugway Proving Ground, UT.
For primary bibliographic entry see Field 5C.
W79-01694

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5C.
W79-01697

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
H. J. Kibbey, C. Hagedorn, and E. L. McCoy.
Applied and Environmental Microbiology, Vol. 35, No. 4, p 711-717. April 1978, 2 fig, 5 tab, 16 ref. OWRT B-048-ORE(1).

Descriptors: *Soil pollution, *Sewage disposal, Waste disposal, Potable water, *Bioindicators, Water pollution sources, *Streptococcus.

The survival, recovery, and identification of Streptococcus isolates from soil was investigated by (1) examination of survival in soil under different moisture and temperature conditions, (2) evaluation of media combinations for recovering fecal streptococci from soil, and (3) partial identification of isolates from diverse habitats. Cool, moist conditions prolonged the survival of Streptococcus faecalis in soil for at least 12 weeks, whereas freezing was lethal, with the populations being reduced up to 95% when several freeze-thaw treatments occurred. Media evaluations indicated that both the efficiency of recovery and enumeration of the fecal streptococci from soil can be influenced by the combination of media used. Taxonomic data revealed a need to develop procedures to differentiate between isolates of fecal origin and plant-derived streptococci that possess many of the cultural reactions of S. faecalis. Recent fecal isolates exhibited a much greater incidence of multiple antibiotic resistance than soil or vegetation isolates, and this characteristic, coupled with the use of enterococci as indicators of fecal contamination in soil systems, is discussed.
W79-01738

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-01750

ARSENIC POLLUTION FROM UNDERDRAINAGE AND RUNOFF FROM GOLF GREENS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
R. L. Duble, J. C. Thomas, and K. W. Brown.
Agronomy Journal, Vol. 70, No. 1, p 71-74, January-February, 1978. 4 fig, 6 ref.

Descriptors: Golf courses, *Arsenicals(Pesticides), *Pollutants, Leachate, Runoff, *Return flows, Sprinkler irrigation, Turf grasses, *Water pollution sources.

A field study was conducted using four lysimeters (each 3 m by 3 m) containing a Tabor sandy loam soil (Udertic Paleustales) and 16 lysimeters containing different sand-soil-peat mixtures, each equipped with a gravel underdrainage system. Bermudagrass (Ckynodon dactylan L.) turf was maintained at a height of approximately 1 cm throughout the investigation. Sprinkler irrigation was used to apply approximately 1 cm of water daily. Tricalcium arsenate was applied on two dates at a rate of 88 kg ha-1. Arsenic was found in significant concentrations in both drainage and runoff from lysimeters. Particularly high concentration (8 ppm As) were found in the drainage from plots previously cored for soil samples. Concentrations of As in the runoff were as great as 14 ppm when a heavy rain occurred shortly after application of Ca3(AsO4)2. Drainage from the plots typically contained 1 to 3 ppm and decreased slowly with time. Arsenic concentrations of 0.8 ppm were still found in the drainage 115 days after application. Concentrations of As in the runoff and drainage from all the plots exceeded acceptable limits for irrigation water established by the U.S. Public Health Service. (Skogerboe-Colorado State)
W79-01752

EFFECT OF SOIL MIXTURES AND IRRIGATION METHODS ON LEACHING OF N IN GOLF GREENS,
Delaware Univ., Newark. Dept. of Plant Science.
W. H. Mitchell, A. L. Morehart, L. J. Cotnoir, B. B. Hesseltine, and D. N. Langton, III.
Agronomy Journal, Vol. 70, No. 1, p 29-35, January-February, 1978. 5 fig, 5 tab, 15 ref.

Descriptors: *Leaching, Golf courses, Nitrogen, *Nitrates, Mixing, Sprinkler irrigation, *Subsurface irrigation, Environmental effects, *Turf grasses, Inhibitors, *Bentgrass, *Nitrapyrin.

The influence of soil mixtures, irrigation systems, and N sources on N leaching was studied in experimental, though functional, golf greens from 1973 to 1976. Sprinkler irrigation was compared with subsurface irrigation. Soil mixtures contained from 60 to 80 percent sand and variable amounts of silt loam topsoil, calcined clay and humus. Nitrogen treatments, included activated sewage sludge, ureaform, ammonium nitrate, 30 percent N solution, anhydrous ammonia and nitrapyrin. Nitrogen leached primarily as NO3-N. Even though about 75 percent of the added was NH4-N, N solution (30 percent N) applied through the subsurface irrigation system caused a sharp increase in NO3-N in the drainage water. Anhydrous ammonia with or without nitrapyrin reduced NO3-N leaching losses for 1 to 2 weeks but had little effect on the average NO3-N concentration over a 47-day period. Subsurface irrigation stimulated turfgrass growth in bands about 20 cm wide located above the irrigation lines. Appearance of growth bands was associated with low temperatures and increased levels of NO3-N in proximity to the irrigation lines. Banding was most apparent in soil mixtures containing low levels of residual soil N and absent when turfgrass was adequately fertilized with N. (Skogerboe-Colorado State)
W79-01777

POSSIBLE TRACE METAL MOBILIZATION OF SELECTED TRACE ELEMENTS FROM OIL-IMPACTED SEDIMENTS,
Colorado Univ., Boulder. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01807

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER, SOUTH DAKOTA, 1970.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
For primary bibliographic entry see Field 5G.
W79-01837

POLLUTION CONCENTRATIONS IN RUNOFF WATER FROM REFUSE PILES,
Auburn Univ., AL. Dept. of Chemical Engineering.
J. A. Guin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 487, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute Bulletin 26, Auburn University, March, 1977, 39 p, 9 fig, 1 tab, 35 ref. OWRT B-056-ALA(3).

Descriptors: *Water quality, *Leachate, *Mass transfer model, *Refuse, Solid waste, Waste disposal, *Water pollution sources, *Weathering, *Leaching, Model studies, Precipitation(Atmospheric), Rainfall, Runoff, Nonpoint pollution sources.

In the processes of removal, refinement and disposal of raw materials, large quantities of waste products become exposed to weathering forces. Subsequent percolation, flushing, and oxidation results in the pollution of waterways, low-lying farmlands and underground aquifers with acidity, alkalinity, hardness, heavy metals, and undesirable organic materials such as tannin and lignin. The need for methodology for estimating the chemical nature and quantity of these leachates becomes more compelling as the extraction of natural materials accelerates. In this work a mass transfer model is formulated which describes the leaching of such pollutants from refuse piles. Certain parameters appearing in the model are studied experimentally using an idealized refuse pile constructed of a difficultly soluble solid. Correlations for mass transfer coefficients in trickling flow and in nonuniform mixtures are developed from these experiments. Finally, the model is applied to an actual refuse pile under natural precipitation and weathering conditions and found to adequately represent the pollutant concentrations in the rainfall runoff.
W79-01892

COMPUTING EVAPORATION FOR INLAND WATER BODIES UNDER A VARIETY OF FETCH AND ATMOSPHERIC STABILITY CONDITIONS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W79-01895

EFFECTS OF THERMAL DISCHARGE UPON A SUBARCTIC STREAM,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. F. Carlson, T. Tilsworth, and C. Hok.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 369. Price codes: A04 in paper copy, A01 in microfiche. Report IWR-49, June 1978. 66 p, 22 fig, 6 tab, 1 ref, 2 append. OWRT B-020-ALAS(1).

Descriptors: Sanitary engineering, Thermal discharge effluents, Water quality, *Alaska, Cold regions, Rivers, *Chena River(Alas), *Thermal pollution, Powerplants, Dissolved oxygen, Temperature, Cooling water.

The Fairbanks Municipal Utilities System power plant uses the Chena River, a subarctic stream, as its primary cooling water discharge source. The heated discharge has a number of effects, the most notable of which is the creation of an extensive downstream open water section during the winter when the river is normally ice covered. The study results showed the following effects: (1) The present MUS thermal discharge does not increase appreciably the temperature of the Chena River because of the relatively small discharge volume compared to the Chena River flow. (2) The discharge causes an open reach of water which varies from 8 to 15 acres during the winter and extends from 1/4 to 1/2 mile downstream. (3) The variation in extent of the open stretch may be controlled by discharge method: a surface spreading scheme results in a faster but more concentrated heat and water vapor rejection, and a direct jet discharge results in the heat and vapor rejection being slightly more spread. (4) A notably beneficial effect of the thermal discharge on the stream is a definite improvement in the DO content of the river as it passes through the MUS discharge reach.
W79-01898

INTERACTION OF CHLORINE AND ORGANIC MOLECULES--EFFECTS OF INORGANICS
Rhode Island Univ., Kingston. Coll. of Pharmacy.
Y. Shimizu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 39. Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Final Report, 1978. 18 p, 12 fig, 4 ref. OWRT B-07 RI(1), 14-34-0001-7184.

Descriptors: *Chlorination, Amino acid, Ferric ons, Manganese ions, Catalysts, *Chlorine, *Organic molecules, *Chemical reactions, *Phenylalanine, Waste water treatment, Organic matter.

The effects of heavy metal ions, particularly ferric and manganese ions on reactions of organic molecules and chlorine in aqueous media were studied. The conversion of amino acids (phenylalanine) to the corresponding aldehydes and nitriles by chlorine treatment was remarkably enhanced in the presence of ferric ion. In particular the enhancement was more evident with the nitrile compound production. The result implies that both the rates and courses of reactions between organics and chlorine (hypochlorite) can be altered greatly in the water containing a high concentration of ferric ion. Also it implies a rapid depreciation of active chlorine in such water. No catalyzing effect was observed with manganese ion.
W79-01903

COMPUTER MODEL FOR PREDICTING POLLUTION IN THE MISSOURI,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
H. Liu, and H-D. Cheng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 392, Price codes: A06 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Completion Report, November 15, 1978. 93 p, 40 fig, 7 tab, 47 ref, 2 append. OWRT A-103-MO(2), 14-34-0001-8027.

Descriptors: Accidental spills, Dispersion, Dispersion coefficient, Fickian model, Dispersion, Modified Fickian models, Non-Fickian models, Pollution forecasts, Rivers, River pollution, Streams, Water pollution sources, *Model studies, *Computer models, *Forecasting, *Missouri.

Whenever there is an accidental spill of hazardous chemicals or radioactive materials into any river, it is vitally important to be able to issue an immediate forecast of the arrival time and peak concentration of a pollutant at each downstream city, to enable water users downstream to take effective precaution measures. Adequate forecast of this type was not possible in the past because of the lack of a proper model to predict one-dimensional dispersion in natural streams. This study resulted in the development of an improved model. The new model is a modified Fickian model which uses a time-dependent dispersion coefficient, a time-scale much greater than the Fischer time-scale, and a Pearson-Type-III distribution of concentration.
W79-01905

OCCURRENCE OF IRON BACTERIA IN GROUND WATER SUPPLIES OF ALABAMA,
Auburn Univ., AL. Water Resources Research Inst.
E. Valkenburg, R. Christian, and M. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 575, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey of Alabama Circular 96, 1975, 19 p, 11 fig, 5 tab, 38 ref, 2 append. OWRT B-045-ALA(2).

Descriptors: *Iron bacteria, *Water wells, Groundwater, Water supply, *Alabama, Water pollution sources, Sampling, *Gallionella, Sphaerotilus.

A state-wide survey was conducted in Alabama to determine the occurrence and the distribution of iron bacteria in water wells and to obtain information useful in alleviating problems caused by these organisms. Of 109 well water samples, 59 (54 percent) contained Gallionella and 33 (30 percent) contained Sphaerotilus-like sheaths as revealed by microscopic examination. Of the 59 microscopical-positive samples for Gallionella 23 (39 percent) yielded cultures. At least one type of iron bacteria was identified in 27 of the 35 counties where samples were collected. These organisms were found in 54 wells, in 3 streams, in surface deposits around 2 springs and 8 wells, and there was evidence that they were present in some soils. Only future experimentation will determine whether a chemical 'cure' for wells is feasible. It is recommended that drillers use clean drilling water, circulation tanks, normal development techniques, and disinfection of completed or repaired wells to prevent future iron bacteria inoculation.
W79-01908

GEOCHEMICAL INTERPRETATION OF KINGS MOUNTAIN, NORTH CAROLINA, ORIENTATION AREA,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
V. Price, and R. B. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as DP-MS-77-10, Price codes: A02 in paper copy, A01 in microfiche. Report No. DP-MS-77-10, March 1977. 17 p, 14 fig, 2 tab, 16 ref. ERDA AT(07-2)-1.

Descriptors: *Geochemistry, *Uranium radioisotopes, *Sediments, *North Carolina, *Geology, *Chemical properties, Trace elements, Water chemistry, Chemical analysis, Analytical techniques, Neutron activation analysis, Instrumentation, Analysis, Testing procedures, Testing, *Uranium, *Kings Mountain(NC), *Uranium compounds, *Uranium monazite, Stream sediments, Uranium exploration.

The Kings Mountain area was chosen for study primarily because of the reported presence of high-uranium monazite. This 750 sq mi area is in the deeply weathered southern Appalachian Piedmont and spans portions of the Inner Piedmont, Kings Mountain, and Charlotte geologic belts. Along the Inner Piedmont-Kings Mountain belt boundary, lithium is being mined; and tin, beryllium, and mica have been mined from pegmatites. Uraninite has been reported from one mica mine. The Cherryville Quartz Monzonite of the Inner Piedmont is the reputed source of Li-BE pegmatites. Uranium concentration maps for -100 to +200 mesh stream sediments indicate the area of monazite abundance. Several samples with more than 100 ppm uranium content appear to be high in uranium-rich resistate minerals. When the uranium content of sediment samples is ratioed to the sum of Hf, Dy, and Th, the anomaly pattern shifts to coincide with uranium highs in ground and surface water samples. False anomalies from concentrations of monazite (Ce, ThPO4), xenotime (Y, DyPO4), and zircon (Zr, HfSiO4) in stream sediment samples thus can be eliminated. Residual anomalies should be related to unusual uranium enrichment of these common minerals or to the presence of an uncommon uranium-rich mineral. Tantalum, beryllium, and tin in stream sediments correspond to high concentrations of uranium in stream and groundwater, but not to uranium in sediments. In an initial reconnaissance, several media should be sampled, and it is essential to correct uranium in sediments for the sample mineralogy. (Henley-ISWS)
W79-01912

BIODEGRADATION OF OIL SLICKS IN THE MARINE ENVIRONMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Biochemistry and Microbiology.
R. Bartha.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 739, Price codes: A02 in paper copy, A01 in microfiche. Report No. N00014-67-A-0115-0005, November 1, 1976. 14 p, 31 ref. ONR N00014-67-A-0115-0005.

Descriptors: *Oil spills, *Microbial degradation, *Oil pollution, *Water pollution treatment, Oil, Fuels, Oil wastes, Water pollution, Marine microorganisms, Water quality, Biodegradation, Pollutants, Nutrients, Fertilization, Orgaic compounds.

The degradation of petroleum hydrocarbons by marine bacteria was studied, with the ultimate aim of using this process in the cleanup of polluting oil. Hydrocarbon-utilizing marine bacteria were isolated, and their growth requirements and metabolic pathways were studied. Enzymatic and regulatory mechanisms responsible for the recalcitrance or delayed utilization of certain hydrocarbons, e.g., polynuclear aromatics and highly branched isoalkanes, were identified. The abundance and distribution of hydrocarbon degrading bacteria were measured in New Jersey coastal waters. The limiting factors of oil biodegradation in the marine environment were studied. Besides the nature of the oil itself, water temperature and mineral nutrients (N, P, Fe) were found to be the most important limiting factors. Given favorable water temperatures, the rate of oil biodegradation can be increased by an order of magnitude or more by supplying the above mineral nutrients to a floating oil slick in oil-soluble (oleophilic) form. This method of application prevents nutrient loss by dilution and does not trigger algal blooms. The patented procedure was considered to be a new cost-effective way to cleanup oceanic oil spills. (Henley-ISWS)
W79-01913

THE CONTRIBUTION OF MERCURY AND CHLORINATED ORGANICS FROM URBAN RUNOFF,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
C. B. Murphy, Jr., and D. J. Carles.
Water Research, Vol. 12, No. 8, p 531-533, 1978. 3 fig, 1 tab, 4 ref.

Descriptors: *New York, *Mercury, *Chlorinated hydrocarbon pesticides, *Urban runoff, *Combined sewers, Rainfall intensity, Rates, Antecedent precipitation, Suspended solids, Sampling, On-site investigations, Toxins, Correlation analysis, Overflow, Annual loadings, Rainfall duration.

The concentration of mercury and chlorinated organics in the combined sewer overflows of Rochester, New York, was measured. The resulting annual loadings of 0.034 kg/ha (0.034 pounds/acre) and 0.011 kg/ha (0.01 pounds/acre) of mercury and chlorinated organics measured in urban runoff are significant. A high degree of correlation exists between the measured concnetration of the toxicants when compared with rainfall intensity, rainfall duration, antecedent number of dry days, and the total suspended solids concentration characteristic of the combined wastewater. (Visocky-ISWS)
W79-01918

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 2G.
W79-01921

HYDROLOGIC PROBLEMS IN KARST REGIONS.
For primary bibliographic entry see Field 2F.
W79-01932

ALPHA RADIATION MONITORING OF NATIONAL PARK SERVICE ADMINISTERED CAVES IN UNITED STATES,
National Park Service, Santa Fe, NM. Southwest Region.
For primary bibliographic entry see Field 2F.
W79-01943

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01947

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
A. I. George.
In: Hydrologic Problems in Karst Regions; Pro-

ceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 340-356, 1977. 10 fig, 3 tab, 33 ref.

Descriptors: *Karst, *Water quality, *Kentucky, *Groundwater, Caves, Geomorphology, Aquifers, Carbonate rocks, Sulfates, Limestones, Carbonates, Mineralogy, Spatial distribution, Areal, Maps, Data collections, Petrology, Evaporites.

Sebkha lithology in the North-Central Kentucky Karst is responsible for the distribution of a high sulfate water quality enclave. The highest concentration of sulfate groundwaters (22-1350 mg/l) exists as a lozenge-shaped enclave positioned over the northwest trending, up dip, zero edge of the lower St. Louis evaporite interval. Interstratal karstification is subroding these evaporite beds and producing high dissolved sulfates. Found throughout the mid-Mississippian Plateau karst at the Salem-St. Louis Limestone contact are: calcareous tufa aprons, dams, and/or marl (algal) biscuits. They may indicate the position of a neo-paleogenic high sulfate karstic resurgence. Certain rare cave occurring sulfates--epsomite, hexahydrite, blodite, mirabilite, and authigenic gypsum, barite, and celestite--have been described from the Flint-Mammoth supersystem. This is the same suite of sulfate minerals known from recent and fossil sebkhas. Barite and celestite filled geodes occur east of the sulfate enclave in the Muldraugh Member. It is possible that the Mississippian sebkhas are the common source of sulfates both to the Muldraugh Member and to sub-sediments in cave passages. (See also W79-01932) (Humphreys-ISWS)
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
E. Werner.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 357-363, 1977. 3 fig, 3 tab, 5 ref.

Descriptors: *Karst, *Water quality, *West Virginia, *Springs, Groundwater, Limestones, Chlorides, Ions, Variability, Water pollution, Salts, On-site investigations, Data collections, *Pocahontas County(WVa), Road salts.

Chloride ion levels were measured in a number of karst springs in northern Pocahontas County, West Virginia, to determine spatial and temporal variations. A fish hatchery derives its water supply from a number of the springs, some of which derive water from streams draining the major highway of this area, and there is some concern about pollution of the springs by road salt. There are severeal drainage basins nearby which differ only in that they do not have a highway, and thus they can be used for comparison purposes. Chloride values did not reach damaging levels in any of the springs during the course of this study. Short period high levels were measured during snowmelt times in the springs draining the highway. These springs also exhibit year-round levels considerably higher than nearby basins without highways. These high levels are attributed to a transfer of chloride-laden water from the surface to the subsurface diffuse flow system during the winter, and a transfer from the diffuse system to the subsurface conduit system throughout the year, with storage in the diffuse system for periods of on the order of one year. (See also W79-01932) (Humphreys-ISWS)
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
Z. A. Saleem.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 364-368, 1977. 1 fig, 11 ref.

Descriptors: *Water quality, *Illinois, *Dolomite, *Groundwater, Aquifers, Water pollution, Chlorides, Ions, Salts, Data collections, On-site investigations, *Chicago(Ill), Road salts.

The use of deicing salts during periods of snowfall and highway icing has been continuously increasing since about 1940 in higher latitude areas of the U.S. and other parts of the world. This increased usage has resulted in the impairment of quality of surface and groundwaters of many areas. The quality of surface water and the carbonate groundwaters of a basin in the Chicago Metropolitan area was investigated during the last four years (1972-1975). A comparison of the groundwater quality data with data gathered between 1931 and 1961 shows that concentrations of all ions have increased. Chloride and sodium ions show the largest increases. The largest increase is in the area where the overburden is thinnest. The water quality also varies from season to season. The increases in concentraions of chloride and sodium ions and spatial variations in their concentrations were attributed to highway deicing chemicals, mostly sodium chloride. (See also W79-01932) (Humphreys-ISWS)
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
P. D. Proctor, G. Kisvarsanyi, and E. Garrison.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 369-387, 1977. 10 fig, 2 tab, 21 ref. OWRT B-054-MO(2).

Descriptors: *Aquifers, *Water quality, *Missouri, *Heavy metals, *On-site data collections, Water supply, Groundwater, Surface waters, Water pollution, Zinc, Lead, Copper, Cadmium, Iron, Mercury, Water wells, Springs, Alkalinity, Hydrogen ion concentration, Water analysis, Chemical analysis, Stratigraphy, Sampling, On-site investigations, Karst, *Joplin(Mo).

Joplin, Missouri, population 40,000, in part of the world-renowned Tri-State Mining District, obtains water mainly from Shoal Creek. Webb City and Carterville share a common water supply from wells. Other nearby towns in the area have independent water supplies from wells. Waters come from deep aquifers of Cambrian and Ordovician age. Outside the cities, individual residences obtain water from shallow aquifers of Mississippian age. These age rocks are host to large zinc-lead ore deposits. The rocks in the area are mainly flat-lying, though local broad folds of westerly to northwesterly trend pitch northwest. Faults of similar trend, and with stratigraphic displacements to 300 feet, cut these rocks. Zinc sulfides, together with lead, copper, iron, and minor cadmium sulfides, remain in pillars, and lesser quantities in wall rock and in the extensive mine dumps in the mining area surrounding these cities. A set of dry fall-early winter water samples from a 100 sq mi area around Joplin included 10 deep well, 24 shallow well, 12 stream, 3 spring, and 3 open-pit lake samples. A second set from the same localities was collected in wet spring-early summer. All samples were analyzed for heavy metal (Pb, Zn, Cu, Cd, Fe, Hg) and alkali content by atomic absorption techniques. Alkalinity, pH, and temperature also were determined. Surface waters have average zinc content (542 ppb), about one-half that of the shallow wells and 15 times that of the deep wells. Mean cadmium content (2 ppb) is similar for surface and shallow wells and three times higher than deep wells. Both copper (8 ppb) and lead (3 ppb) have greater average content in the shallow well environment. Average iron content is highest in deep wells (112 ppb), next in shallow wells. Calcium (76 ppm), magnesium (4.1 ppm) and sodium (8.7 ppm) have similar average content in the surface-near surface waters. Waters in the older dolomitic rocks in the deep wells have lesser calcium and almost 5x as much magnesium. Potassium (2.2 ppm) shows about 1 ppm variation in the surface-near surface-deep well environment. Dry fall water samples have higher mean values than wetter season water samples. For the related seasonal water samples in the 100 sq mi area around Joplin, some 25% of the shallow well water samples, 10% of the deep well samples, and 16% of the surface water samples exceeded the recommended Public Health Service drinking water standards for one or more heavy metals. When compared to Missouri effluent standards, most water samples exceed the ratio of 1.0 for heavy metals. An alternate water supply exists in the deep aquifer zone of the Cambro-Ordovician rocks. (See also W79-01932) (Humphreys-ISWS)
W79-01969

GROUND WATER POLLUTION OF A LIMESTONE AQUIFER BY CAUSTIC WASTE,
Geological Survey of Jamica, Kingston. Water Resources Div.
L. A. Wedderburn.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 388-404, 1977. 4 fig, 3 tab, 5 ref.

Descriptors: *Water pollution, *Karst hydrology, *Waste disposal, *Aquifers, Limestones, Karst, Hydrogeology, Ponds, Groundwater, Foreign countries, Foreign research, Sodium, Iron, Alkalis(Bases), Ions, Infiltration, On-site investigations, On-site data collections, *Jamaica, Alumina, waste disposal.

Caustic waste known locally as 'red mud' produced from the Bayer process for extraction of alumina from Jamaican bauxite is ponded in karstic depressions where it may infiltrate to the ground water table. As discharged from the plant, the red mud has a water content of 75% to 85%, but due to the small, almost colloidal solid particles in suspension, settles slowly to about 35% clear supernatant liquid. The pollutants present in the waste (sodium ions, iron hydroxide, organic substances) are in quantities sufficient to make the groundwater unfit for domestic, agricultural, and some industrial uses. Analysis of groundwater in the vicinity of these disposal sites indicated that at 2 of the 5 sites at which the process is carried out pollution of groundwater has taken place. Waste disposal ponds are located on karstified limestone which have high vertical permeability and are in the direct path of groundwater flow to major groundwater reservoirs; consequently they pose a serious threat to the groundwater reserves of the Island. Remedial actions suggested include better pond management, reduction of caustic and other contaminants in the waste, and groundwater abstraction from the affected areas to contain the spread of the pollutant. (See also W79-01932) (Humphreys-ISWS)
W79-01970

SUBSURFACE WATER BEHAVIOR AND SEWAGE EFFLUENT IRRIGATION IN THE MISSOURI OZARKS,
Missouri Univ., Columbia, School of Forestry, Fisheries and Wildlife.
L. C. Tennyson, and C. D. Settergren.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 411-418, 1977. 5 fig, 2 tab, 10 ref.

Descriptors: *Waste water disposal, *Irrigation, *Missouri, *Monitoring, Subsurface waters, Sewage effluents, Sprinkler irrigation, Water pollu

on sources, Vadose water, Groundwater, On-site sts, Methodology, Water quality, Karst, Water vels, Phosphorus, *Missouri Ozarks.

ne use of land sites in karst terrain for disposal of astewater has generated an area of controversy recent years. Karst groundwater supply systems e often highly vulnerable to contamination from traneous sources such as waste effluents. This udy was designed to investigate the effects of wage effluent irrigation on the subsurface water a land disposal site in the Southern Missouri zarks. Groundwater and vadose water were onitored to evaluate the renovation potential and ater table behavior on a land disposal site. A rest bottomland site was sprinkler irrigated with eated sewage effluent at application rates of 5.1 n/week and 11.9 cm/week. Ammonium nitrogen vels in vadose and groundwater increased during e 11.9 cm/week schedule. Phosphorus concen- ations were not affected by a change in irrigation te; however, renovation of effluent phosphorus as occurring. Groundwater level and response ne varied with the rate of application of effluent. roundwater level response to irrigation ranged om 0.5 hours to 6.0 hours. Higher irrigation rate oduced a shallower water table, a decrease in sponse time, and an increase in ammonium nitro- n. (See also W79-01932) (Humphreys-ISWS)
79-01972

HE EFFECTS OF HIGHWAY CONSTRUC- ON ON THE HYDROGEOLOGIC ENVIRON- ENT AT BOWDEN, WEST VIRGINIA,
wden National Fish Hatchery, WV.
R. Garton, Jr.
Hydrologic Problems in Karst Regions; Pro- edings of Symposium held at Western Kentucky niv., Bowling Green, Kentucky, April 26-29, 76. Department of Geography and Geology, estern Kentucky University, Bowling Green, ntucky, p 439-449, 1977. 8 fig.

escriptors: *Highways, *West Virginia, *Envi- nmental effect, *Karst, Hydrogeology, Karst hy- ology, Construction, Caves, Karst, Springs, ater supply, Water quality, Sinks, Geology, ater pollution sources, Fish hatcheries, owden(WVA).

e Bowden National fish hatchery is the most oductive trout hatchery in the United States. e Bowden Hatchery began operations in 1960, d up until January, 1975, it had no problems th water supply. The water supply consists of o karst springs, the North Spring and the South ring, with an average combined yield of 2,000 llons per minute. In times of low flow the Shav- Fork River is also used. Construction began on Elkins-to-Bowden segment of Corridor-H, a t of interstate highway 79, in 1972. In January 75, excavation operations near Bowden Hatch- began to uncover pits and caverns. This result- in large quantities of clay and silt being washed o the caverns. Since the caverns are conduits to South Spring, This spring became very turbid ring storms. In one incident more than 150,000 ut died due to silt build-up on their gills which ulted in asphyxiation. Numerous fish kills oc- red throughout 1975, as well as fish poisoning diesel fuels which were spilled on the construc- n site and washed into the caverns. In addition turbidity, the newly discovered conduits were eaded, resulting in reduced flows of the South ring and near by wells. This study was under- e for the Fish and Wildlife Service to determine extent of damage to the hydrogeologic envi- nment of the South Spring, and to determine if nage might occur to the North Spring as road nstruction continues. It was determined by this dy that future road construction will adversely ect the North Spring in both quantity and qual- of the water. (See also W79-01932) (Hum- reys-ISWS)
79-01975

NTEMPORARY AND HISTORICAL TRACE ETAL LOADINGS TO THE SEDIMENTS OF UR LAKES OF THE LAKE WASHINGTON RAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. E. Spyridakis, and R. S. Barnes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 365, Price codes: A05 in paper copy, A01 in microfiche. State of Washington Water Research Center, Washington State University, Pullman, Project Completion Report, 1978, 70 p, 16 fig, 7 tab, 51 ref. OWRT A-083-WASH(1). 14-34-0001-6050.

Descriptors: Water quality, Urban pollution, *Trace metals, Sediment dating, *Lake sediments, Lead, Zinc, Copper, *Washington, Urbanization, Water pollution sources, Lakes, Chemical analysis, Radioactive dating, *Sedimentation rates.

Contemporary and historical loadings of lead, zinc and copper to the profundal sediments of Lakes Washington, Sammamish, Chester Morse and Findley were determined using chemical analysis and 210Pb dating of sediment cores. Elemental sedimentation rates, a cross product of the sedimentation rate and sediment concentration of a given element, were corrected for natural background concentrations and rates, and extrapolated across established sediment accumulating areas to give a conservative estimate of the pollutional trace metal loadings to each lake. The resulting chronological loadings appeared consistent with the known cultural history of the individual watersheds. Substantial alterations in sedimentation rates were noted in all lakes where deforestation, road building, suburbanization or urbanization had occurred in the lake's watershed. The quantities, elemental ratios and pollutional histories of copper, lead and zinc in the lake sediments indicate that aeolian inputs are the dominant source of trace metal pollution to the lake sediments at the present time. Pollutional loading rates of all three metals followed the gradient Washington > Sammamish > Chester Morse > Findley consistent with a gradient of cultural use intensities from extremely urban to wilderness.
W79-01985

A STUDY OF PARAMETER ESTIMATION PROCEDURES OF A MODEL FOR LAKE PHOSPHORUS DYNAMICS,
Wiezmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5C.
W79-01994

NITROUS OXIDE IN THE OXYGEN MINIMUM OF THE EASTERN TROPICAL NORTH PACIFIC: EVIDENCE FOR ITS CONSUMPTION DURING DENITRIFICATION AND POSSIBLE MECHANISMS FOR ITS PRODUCTION,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01997

EUTROPHICATION OF WATER BODIES: INSIGHTS FOR AN AGE-OLD PROBLEM,
Texas Univ.-Dallas, Richardson.
For primary bibliographic entry see Field 5C.
W79-02000

5C. Effects Of Pollution

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
For primary bibliographic entry see Field 6G.
W79-01515

THE EFFECT OF IRRIGATION ON THE SURVIVAL AND DEVELOPMENT OF PARASITIC NEMATODE LARVAE IN WESTERN MONTANA,
Montana State Univ., Bozeman.
D. E. Worley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 225, Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 96, Montana State University, Bozeman, August 1978. 18 p, 2 fig, 4 tab, 6 ref. OWRT A-093-MONT(1). 14-31-0001-5026.

Descriptors: *Animal parasites, *Larval growth stage, *Irrigation effects, Pasture management, On-site data collections, Dictyocaulus viviparus, Bovine lungworm larvae, *Montana.

Field and laboratory studies were initiated in November, 1975 and continued through November, 1977 to determine the effect of supplementary water applied periodically to pasture plots on the survival of bovine lungworm larvae (Dictyocaulus viviparus). Concurrent observations were made of larval survival on dry land plots which received only natural precipitation. Irrigation had a substantial effect on prolonging larval survival on field plots in which pasture vegetation was artificially reduced to a height of about 3 in. to simulate the effect of grazing or hay harvest. After 35 days, approximately twice as many viable larvae were present on unclipped as compared with clipped lots. Studies on the distance and rate of lateral larval migration on pasture plots indicated that the maximum distance that lungworm larvae moved from their point of origin was 3 in. Lateral movement took place only during the first 48 hrs. after larval deposition on pasturem herbage. Although it was not possible to make direct correlations between meteorologic conditions and larval survival rates, it was found that high soil moisture levels maintained by irrigation stimulated plant growth which in turn created a wind barrier near the ground which reduced wind velocity and maintained relative humidity, potential evaporation and soil moisture at higher levels than in nonirrigated areas.
W79-01540

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and A. W. McIntosh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 264, Price codes: A03 in paper copy, A01 in microfiche. Partial Technical Completion Report, August 1978. 47 p, 16 fig, 10 tab, 8 ref. OWRT A-048-NJ(3). 14-34-0001-8032.

Descriptors: *Water pollution, *Environmental effects, Water quality, Erosion, Flood plain management, Bank erosion, Urban drainage, *Stream surveillance, *Biological health of streams.

Streams in urbanizing areas are subject to a variety of stresses produced by the processes of growth; most of the resulting changes are environmentally adverse. Unfavorable conditions may be improved by various government programs, such as flood control and water pollution control. However, before remedial programs can be adopted, the problems and the processes which create them must be understood. Water quality and discharge of the larger rivers are monitored by a network of USGS/State gaging stations. However, small streams are so numerous, and conditions in them change so rapidly that conventional monitoring networks cannot deal with them. Moreover, the condition of such streams is more accuractely monitored by biological evaluations than by measurements of the usual water quality parameters. Therefore, a stream surveillance program has been devised to evaluate the biological health of streams, the pollution sources to which it is subject, and certain other physical conditions relevant to management. These include symptoms of stream

encroachment, channel erosion or filling, and obstruction to flow, either natural or artificial.
W79-01543

FUNGAL DEGRADATION OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE,
Auburn Univ., AL.
For primary bibliographic entry see Field 5E.
W79-01547

METAL CONCENTRATIONS (AS, CD, CU, PB AND ZN) IN SHORTHORN SCULPINS, MYOXOCEPHALUS SCORPIUS (LINNAEUS) AND ARCTIC CHAR, SALVELINUS ALPINUS (LINNAEUS), FROM THE VICINITY OF STRATHCONA SOUND, NORTHWEST TERRITORIES,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5B.
W79-01552

BIOLOGICAL ASSESSMENT OF WATER QUALITY IN A LARGE RIVER SYSTEM: AN EVALUATION OF A METHOD FOR FISHES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-01553

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 6G.
W79-01555

STUDIES ON THE DECOMPOSITION OF ALLOCHTHONOUS DETRITUS IN TWO SOUTHERN CALIFORNIA STREAMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01588

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
For primary bibliographic entry see Field 2H.
W79-01589

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 6G.
W79-01591

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX A: IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources
J. P. Koenings.
Publication No. 016440-7-T, December 1975. 2 fig, 3 tab, 25 ref. AT(11-1)-1771.

Descriptors: *Iron, *Bogs, *Lakes, Acidic water, Colloids, Particle size, Dissolved solids, *Michigan, Meromixis, Oxidation, Epilimnion, Hypolimnion, Methodology, Analytical techniques, Tracers, Filtration, Dialysis, *North Gate Lake(MI), Bathyophenanthroline.

Iron compounds in the epilimnion and hypolim- [illegible] County, MI, were fractionated and characterized to assess effects of oxidizing and reducing environments on potential colloidal organic matter (COM)- iron complexation. North Gate Lake, pH 4-5 is a small, highly stained, meromictic bog lake with a surface area of about 0.4 ha and a maximum depth of 8 m. The open water is surrounded by a Sphagnum mat. Iron fractions were chemically separated by reactivity to bathyophenanthroline (BPN) after specific digestion procedures, and physical separation was accomplished by means of a plastic anaerobic in-situ filtration sampler (450 nm), and in-situ dialysis (4.8 nm). Three sizes were isolated particulate, colloidal, and dissolved. Colloidal-size reactive ferric iron predominated in the oxygenated epilimnion, while dialyzable or dissolved ferrous iron increased with depth. Organic matter was present in a nontransient colloidal state. Inorganic nonreactive iron species such as Fe(OH)3 comprised only a small fraction of total iron, unlike pH 6-8 lakes. In acid bog lakes, ferric iron is not colloidal as an inorganic complex, OH(-), but colloidal as reactive Fe(+3) by complexation with the colloidal organic acids. After thermally-induced mixing with anaerobic waters, ferric iron is reduced and dissolved. The presence of a residual ferrous organic complex is suggested, however, by the fact that some of the BPN-reactive iron remains colloidal. (See also W78-02510) (Lynch-W sconsin)
W79-01597

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A) APPENDIX B: THE INFLUENCE OF COLLOIDAL ORGANIC MATTER (COM) UPON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
Publication No. 016440-7-T, December 1975. 6 tab, 26 ref. AT(11-1)-1771.

Descriptors: *Iron, *Phosphorus, *Bogs, *Cycles, *Lakes, *Michigan, Nutrients, Acidic water, Colloids, Organic matter, Meromixis, Dialysis, Filtration, Tracers, Stratification, Dissolved solids, *North Gate Lake(MI), Bathophenanthroline.

The influence of yellow colloidal organic matter (COM) on iron-phosphorus associations in a bog lake, and indirect consequences of this interaction, are described. The study was conducted in a small, acid meromictic bog lake, North Gate Lake, Gogebic County, MI, which has a surface area of about 0.4 ha and a maximum depth of 8 m; the open water is surrounded by a Sphagnum mat. Mechanical separation of particulate, colloidal, and dissolved forms of iron and phosphorus from water was made by filtration and dialysis. Bathophenanthroline (BPM) was used for measuring ferrous iron. Mixing in the lake occurs only to a depth of 5-6 m, leaving a monimolimnion which is never oxygenated below 6.5-7.0 m. The 5-m depth is usually anaerobic, while the 2-m depth alternates between very low oxygen and anaerobic conditions. The surface is always oxygenated, but only at 50-70% saturation. BPN-reactive ferrous iron existed in true solution in the anaerobic monimolimnion, whereas in the aerobic epilimnion reactive ferric iron was colloidal. Intermediate depths contained two BPN-reactive forms of ferrous iron--dialyzable Fe(+2) and colloidal Fe(II), which may be present as a COM-Fe(+2) complex. COM concentration had important effects on dialyzable Fe(+2) and dialyzable orthophosphate in anaerobic strata prior to aeration, and appeared to mask cationic properties of colloidal ferric iron and to retard formation of nonreactive Fe(III). (See also W78-02510) (Lynch-Wisconsin)
W79-01598

IMPACT OF RESIDUAL BIOSOLIDS ON RECEIVING WATER QUALITY,
H. S. Costa, D. L. Borton, and J. J. McKeown.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 57-62. 3 fig, 15 ref, 1 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Water quality, *Aquatic life, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Suspended solids, Fish, Aquatic insects, Food chains, Bottom sediments, Biological treatment, Aquatic animals, Pollutants.

A review is presented of studies undertaken by the U.S. pulp and paper industry to determine the impact of nonsettleable solids of biological treatment origin on the aquatic community and their fate in receiving waters. At levels occurring in receiving waters, nonsettleable solids do not generate detectable benthic deposition, do not harm fish raised in their presence, and do not alter the composition of the aquatic insect community. Nonsettleable solids are shown to enter the food chain by ingestion and incorporation into cellular material of aquatic insects. The questions raised regarding the significance of their presence in the environment seem to have been satisfactorily answered and the need for control technology beyond that already achieved is not evident. (Swichtenberg-IPC)
W79-01609

CHARACTERISTICS AND USE OF NONSETTEABLE SOLIDS BY AN AQUATIC FOOD CHAIN ORGANISM,
Institute of Paper Chemistry, Appleton, WI.
E. Zanella, J. Conkey, and M. Tesmer.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 157-163. 1 fig, 1 illus, 7 ref, 7 tab.

Descriptors: *Pulp wastes, *Food chains, *Suspended solids, *Aquatic life, Effluents, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Aerated lagoons, Air, Oxygen, Clays, Caddisflies, Insects, Aquatic insects, Foods, Larva, Daphnia, Zooplankton, Pulp and paper industry.

Studies conducted at the Institute of Paper Chemistry (Appleton, Wisconsin) showed that nonsettleable solids discharged from oxygen-activated and air-activated sludge and aerated lagoon effluent treatment systems were 40-65% biological in nature of which between 5 and 35% was viable. Viability was greater in summer than in winter samples, with the largest variation evident for the aerated lagoon treatment system. Nonbiologic material included inorganic clay and coating materials. The great majority of particles were less than 2 micrometers in diameter and represented 35-58% of the volume. The total range of particle size spanned 1-16 micrometers. The nonsettleable solids were used as food by large caddis fly (Hydropsyche walkeri) larvae, however, smaller larvae were unable to utilize these materials. Daphnia sp, a common filter-feedng zooplankton, also demonstrated the ability to utilize nonsettleable solids as an adequate food source. (Swichtenberg-IPC)
W79-01617

BIOLOGICAL IMPACT OF VARIOUS CHLORINATED PHENOLICS AND RELATED COMPOUNDS ON DAPHNIA MAGNA,
State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
P. R. Durkin.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 165-169. 16 ref, 2 tab.

Descriptors: *Bleaching wastes, *Water pollution effects, *Daphnia, Wastes, Industrial wastes, Pulp and paper industry, Pulp wastes, Lethal limit, Daphnia magna, Aquatic animals, Aromatic compounds, Organic compounds, Toxicity, Water pollution sources, Phenols, Equations, Zooplankton.

Acute lethal and sublethal responses in Daphnia magna were used to evaluate the toxicity of methoxy-substituted aromatic model compounds of the toxic components of kraft bleach plant effluent, viz., spent chlorination liquor. A series of chlorinated methylcatechols, methylveratroles, and methoxymethylphenols were selected for study. Quantitati

nemical structure vs. biological activity correla-
ons were made between both acute lethal and
radycardic potencies and aromatic substituent
onstants, viz., the lipophilic, the electron field and
esonance, and molar refractivity parameters. Both
pes of biological responses could be described by
general equation giving correlation coefficients
more than 0.9. However, structure vs. activity
uations using fewer parameters suggested that
e relationship between bradycardia and lethality
as incidental rather than intrinsic. The relevance
these findings to the toxicity of kraft bleachery
fluents is discussed. (Swichtenberg-IPC)
79-01618

ISTRIBUTION AND PRODUCTION OF
AGO PONDWEED (POTAMOGETON PEC-
INATUS L.) ON A NORTHERN PRAIRIE
ARSH,
elta Waterfowl Research Station, Portage la
rairie (Manitoba).
or primary bibliographic entry see Field 2I.
79-01629

MODEL FOR PREDICTING THE EFFECTS
F SEWAGE EFFLUENT ON WETLAND ECO-
YSTEMS,
ichigan Univ., Ann Arbor. Wetlands Ecosystem
esearch Group.
R. Dixon, and J. A. Kadlec.
vailable from the National Technical Information
rvice, Springfield, VA 22161 as PB-273 024,
ice codes: A05 in paper copy, A01 in microfiche.
ebruary, 1975. 66 p, 15 fig, 3 tab, 69 ref.

escriptors: *Wetlands, *Mathematical model,
ewage, *Biomass, Model studies, Forecasting,
me series analysis, Biodegradation, Waste water
sposal, Productivity, Litter decomposition.

mathematical model of the organic components
a wetland ecosystem is developed and analyzed.
ne objective of the model is to be able to forecast
e effects of sewage wastewater disposal on the
osystem; this requires that the variables of water
d nutrients be included in the models of the
veral processes which may be affected by the
astewater disposal. Components of the ecosystem
e vascular plants, standing dead biomass, stem
d leaf litter, and soil. The model consists of a set
first-order, nonlinear differential equations rep-
senting the mass balance of the biomass compo-
nts of the system. Its analysis indicated the
odel's credibility as a first-time model that can be
ed as an aid in making decisions about the feasi-
ity of using a wetland ecosystem for wastewater
posal. (Steiner-Mass)
79-01643

ETLAND PLANT COMMUNITIES ALONG
HE EASTERN SHORELINE OF LAKE ON-
ARIO,
ate Univ. of New York at Syracuse. Dept. of
rest Botany.
r primary bibliographic entry see Field 2I.
79-01644

OMBINED TEMPERATURE-SALINITY EF-
CTS ON GRASS SHRIMP,
lifornia Univ., Davis. Dept. of Land, Air and
ater.
Khorram, and W. W. Knight.
SCE, Journal of the Environmental Engineering
vision, Vol. 103, No. EE3, Proc. Paper 12970,
ne 1977, p 381-388. (California Water Resources
nter Project UCAL-WRC-W-243).

escriptors: *Bioassay, *Deltas, Environmental
gineering, *Estuaries, Hydrology, Runoff, *Sa-
ity, *Shrimp, *Temperature, Water distribution,
ater pollution, Water quality, Water supply,
alifornia, *San Pablo Bay(Calif).

ndard (Sprague) static bioassay tests were used
determine the effects of temperature, salinity,
l their interaction on grass shrimp (Crangon
nciscorum) survival after 24 hr, 48 hr, 72 hr, and
hr exposure periods. All test organisms were collected from San Pablo Bay, California. Temperature and salinity had highly significant effects on survival and responses to changes in temperature and salinity were strongly interdependent. The optimal ranges of temperature and salinity for 90% survival at 96 hr were 14.5C to 17.0C and 18% to 20%. These values fall within the environmental fluctuations of the test organism's natural habitat. These results are in agreement with values reported for similar crustaceans. The interaction between effects of temperature and salinity appear to be an apparent inherent property of organisms. (Snyder-Calif, Davis)
W79-01645

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W79-01650

FILTER-FEEDING ETHOLOGY OF BENTHIC INVERTEBRATES (ASCIDIANS). V. INFLUENCE OF TEMPERATURE ON PUMPING, FILTRATION, AND DIGESTION RATES AND RHYTHMS IN PHALLUSIA MAMILLATA,
Paris-6 Univ (France). Lab. Arago.
A. F. Medioni.
Marine Biology, Vol. 48, p 251-259, 1978. 4 fig, 5 tab, 17 ref.

Descriptors: *Water temperature, *Digestion, *Filtration, Benthic fauna, Invertebrates, Animal physiology, Animal metabolism, Seasonal, Currents(Water), Food habits, Animal behavior, *Ascidians, *Phallusia, Filter feeding, Invertebrates.

The influence of temperature has been studied simultaneously on the pumping, filtration, and digestion rates of Phallusia mammillata. Eighteen experiments were made between 7 and 25C on 5 individuals. As for pumping, maximum values were observed at 15C decreasing with lower and higher temperatures, such decreases being more marked at the higher temperatures. The filtering efficiency was fairly consistent throughout an experiment; the pumping and filtration curves were in fact almost parallel. The filtering efficiency of the branchial sac was high, with constant values at 10 and 15C; it became smaller at 20C, with a higher coefficient of variation. The digestion rate also displayed maximum values at 15C. It was lower at 10C and reached its minimum at 20C. The higher temperature affected the percentage of food utilization, which showed smaller values at 20C than at 10C and 15C. (EIS-Deal)
W79-01653

EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
E. M. Stern, and W. B. Stickle.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 035, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Technical Report D-78-21, June 1978. 118 p, 3 tab.

Descriptors: *Turbidity, *Suspended solids, *Suspended load, *Aquatic environment, *Environmental effects, *Bibliographies, *Reviews, *Dredged material disposal.

Literature review of the effects of turbidity and suspended material in aquatic environmentas covering: definitions, units of measure, and methods of measurement; origins; and effects in aquatic environments. Turbidity, regardless of the multiplicity of definitions, units of measure, and methods of measurement, is an expression of the optical properties of water that cause light to be scattered and absorbed rather than transmitted in a straight line. Turbidity is not the same as silation, although the terms have been used synonymously in the past. The literature indicates that turbidity and suspended solids conditions typically created by most dredging and disposal operations are of short duration and are unlikely to produce severe and irreversible ecological effects: possible exceptions to this generalization are coral reefs and other communities especially sensitive to turbidity. Any possible effects of turbidity and suspended material in aquatic environments may be further minimized by careful selection of disposal sites; keying operations to seasonal cycles in biological activity; and special consideration of areas that serve as nursery grounds. (WES)
W79-01656

USE OF DREDGED MATERIAL ISLANDS BY COLONICAL SEABIRDS AND WADING BIRDS IN NEW JERSEY,
Manomet Bird Observatory, MA.
For primary bibliographic entry see Field 5E.
W79-01658

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
J. F. Parnell, D. M. DuMond, and R. N. Needham.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 000, Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-9, May 1978. 286 p, 4 append, 57 tab, 32 fig, 58 ref. Also designated as University of North Carolina at Wilmington Contribution in Marine Sciences no. 797.

Descriptors: *Birds, *Estuaries, *Islands, *Plant populations, *North Carolina, *Succession, *Dredged material, *Waste disposal sites.

Compares plant succession and bird utilization on diked and undiked dredged material islands in North Carolina estuaries. After a site is diked, deposition of dredged material may be delayed for several years or it may occur immediately. Unfilled diked islands that were studied had a complex topographic zonation. Plant succession was highly variable on these unfilled sites, with topography, substrate particle size, and availability of water being major causative factors. Plant succession on diked and filled sites was similar to that on undiked islands except that dikes tended to vegetate more quickly than did the deposits on outer portions of undiked sites. Only the least and gull-billed terns were found nesting predominantly on diked sites, with most nesting gulls and terns locating the majority of their breeding colonies on undiked sites. Habitat diversity is expected to decrease on mature diked islands as such sites continue to receive dredged material. Such mature islands will likely not be as suitable for nesting colonial birds as either undiked or young diked islands. It is recommended that diking not be used on islands heavily used by nesting waterbirds or wading birds. (WES)
W79-01659

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W79-01666

LEAD ACCUMULATION RATES IN TISSUES OF THE ESTUARINE TELEOST FISH, GILLICHTHYS MIRABILIS: SALINITY AND TEMPERATURE EFFECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
G. N. Somero, T. J. Chow, P. H. Yancey, and C. B. Snyder.
Archives of Environmental Contamination & Toxicology, Vol. 6, No. 2/3, 1977, p 337-348, 2 fig, 4 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, *Temperature, *Salinity, *Lead, Fish, Estuaries, *Teleosts.

The four environmental variables considered in this work were sea water lead concentration, duration of exposure to lead, salinity, and temperature. Spleen, gills, fins, and intestine were found to accumulate the greatest amounts of lead with liver and muscle accumulating the least. Lead accumulation rate was dependent on both salinity and temperature with fish held at high temperatures accumulating more lead than those held at low temperatures and accumulation rate being inversely proportional to salinity. Decay of lead was observed in tissues possessing a covering of mucus. It was suggested that this was due to a complexing of the lead with mucus and subsequently being lost as the mucus sloughed off. Lead levels continued to rise in fish returned to natural seawater from lead-spiked seawater. (Chilton-ORNL)
W79-01667

TEMPERATURE REQUIREMENTS OF TILAPIA ZILLII,
California Univ., Riverside. Div. of Biological Control.
W. J. Hauser.
California Fish and Game, Vol. 63, No. 4, October 1977, p 228-233, 2 tab, 13 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Temperature, Mortality, Biocontrol, *Cichlids, California, Laboratory tests, On-site investigations, Irrigation canals, Resistance, *Tilapia zillii.

Temperature requirements of the African cichlid, Tilapia zillii which is used for biological control of aquatic weeds were determined through laboratory experiments and field observations. Optimum temperature for feeding, growth and spawning was found to be between 20 and 32C. Water temperatures above 39.5C and below 11.2C resulted in deaths with extreme upper and lower lethal temperature tolerance limits being 42.5C and 6.5C. Field observations showed that survival was lessened with two-week exposures to 13.0C. It was concluded that these temperature requirements lessened the usefulness of the organism as a biological control agent in irrigation canals of southern California. (Chilton-ORNL)
W79-01668

FEEDING AND GROWTH RATES OF POLINICES DUPLICATUS PREYING ON MYA ARENARIA AT BARNSTABLE HARBOR, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
D. C. Edwards, and J. D. Heubner.
Ecology, Vol. 58, No. 6, Autumn 1977, p 1218-1236, 11 fig, 5 tab, 89 ref. NSF-U.R.P. GY7297.

Descriptors: Environmental effects, Temperature, *Feeding rates, *Growth rates, *Snails, *Predation, *Clams, *Massachusetts, *Barnstable Harbor(Mass).

Field observation showed that the major factors affecting feeding rates of the snail Polinices duplicatus eating the clam Mya arenaria were food supply, temperature, and predator size. Food supply studies showed that snails of each size ate similar numbers of prey/time when provided with excess prey of differing sizes. Temperature studies showed that feeding peaked at 0.6 Mya/snail/day in warm months and dropped to zero for 4 months in cold months. Larger predators consistently ate larger prey than did smaller ones with 4th-yr. snails ingesting 385 kilojoules/yr and 2nd-yr snails ingesting approximately 218 kJ/yr. Growth rates were correlated more with a snails age than its size. 2nd-yr snails grew nearly 3-fold in diameter while 4th-yr snails grew only 1.2-fold. (Chilton-ORNL)
W79-01669

TOXICITY OF INTERMITTENT CHLORINATION TO FRESHWATER FISH: INFLUENCE OF TEMPERATURE AND CHLORINE FORM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
A. G. Heath.
Hydrobiologia, Vol 56, No 1, 1977, p 39-47, 7 fig, 6 tab, 19 ref.

Descriptors: Environmental effects, *Chlorination, *Temperature, *Water pollution effects, Thermal pollution, Fish, *Toxicity, Freshwater, Rainbow trout, Salmon, Carp, Shiners, Channel catfish, *Chlorine.

Bioassay results showed that temperature has relatively little effect on the lethal concentrations of either free chlorine or monochloramine to Salmo gairdneri, Oncorhynchus kisutch, Notemigonus crysoleucas, Cyprinus carpio and Ictalurus punctatus when the exposure is delivered intermittently. This conclusion should not necessarily be extended to conditions where a constant chlorine concentration is used. A greater toxicity to free chlorine compared to monochloramine was found. S. gairdneri, O. kisutch, and I. punctatus were the most sensitive to both types of chlorine with C. carpio bein most resistant and N. crysoleucas being intermediate in sensitivity. (Chilton-ORNL)
W79-01670

CONSEQUENCES OF PERIODIC APPLICATIONS OF COPPER SULFATE AND SIMAZINE FOR PHYTOPLANKTON CONTROL IN CATFISH PONDS,
Auburn Univ., AL. International Center for Aquacultures.
C. S. Tucker, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol 107, No 2, March 1978, p 316-320, 5 fig, 1 tab, 22 ref.

Descriptors: Environmental effects, *Water pollution effects, Population, Density, Aquatic populations, *Phytoplankton, *Copper sulfate, Toxicity, *Simazine.

Phytoplankton density as estimated from chlorophyll a concentrations and total counts of phytoplankton was initially lower in ponds treated with copper sulfate than in control ponds but steadily increased over a three month period to a point where density was comparable in control ponds and ponds treated with copper sulfate. Phytoplankton density was greatly depressed in ponds treated with simazine but simazine applications over an extended period resulted in low dissolved oxygen concentrations which caused decreased fish yields and poor conversion ratios. Fish yield and conversion ratios were not affected by copper sulfate treatment. (Chilton-ORNL)
W79-01672

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
T. Y. J. Chu, R. J. Ruane, and P. A. Krenkel.
Journal of the Water Pollution Control Federation, Vol 50, No 11, November 1978, p 2494-2508, 13 fig, 5 tab, 16 ref.

Descriptors: *Water pollution effects, *Powerplants, Effluents, Fly ash, Water quality, Ponds, Settling basins.

Characteristics of ash sluicing water were found to vary. The main factors affecting the variation were the source of the coal, method of firing, quantity and quality of sluicing water, efficiency of fly ash collecting methods, and performance of the settling ponds. The pH pond discharges was primarily influenced by calcium and sulfate concentrations in effluents from pulverized coal plants, method or firing and buffering capacity of raw water used for sluicing. Concentrations of suspended solids in the discharges appeared to be influenced by cenospheres. Twelve schemes for reuse of ash pond effluents were presented- four or these (complete reuse of bottom ash sluicing water, reuse of combined ash sluicing water for make-up wate in SO2 scrubbers, complete reuse of both botto and fly ash sluicing waters, and recycling of con bined ash sluicing water with treatment of blow down prior to discharge to a stream) in detail. Us of mathematical models was employed in the stu ies to represent the water balance applicable to th twelve combinations of schemes. (Chilton-ORNL
W79-01674

ZOOBENTHOS IN THERMAL DISCHARG TO WESTERN LAKE ERIE,
Michigan State Univ., East Lansing.
R. A. Cole, and J. E. Kelly.
Journal of the Water Pollution Control Federatio Vol 50, No 11, November 1978, p 2509-2521, fig, 4 tab, 30 ref.

Descriptors: Environmental effects, *Water poll tion effects, *Thermal pollution, *Benthos, *Zo plankton, *Cooling water, Discharge(Water), La Erie.

This 5 year study of benthic macroinvertebrates and near a once through cooling system include sampling of zoobenthos, oxygen concentratio temperature, sedimentary particle size, carbon a nitrogen. Zoobenthos were primarily tubificids a chironomids. Benthic abundance and sedimenta nitrogen and carbon were positively correlate with the percentage of silt and clay in the sed ment. Abundance, diversity and mean individu size of benthos declined in the discharge canal a an adjacent heated area. This decline in abundan and diversity were related to intense fish use of t thermal discharge. Increased abundance and mea size in the river appeared to be response to chang in water quality resulting from pumping of w oxygenated lake water through the degraded riv channel. (Chilton-ORNL)
W79-01675

POWER PLANT COOLING WATER CHLOR INATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley.
S. J. Hergott, D. Jenkins, and J. F. Thomas.
Journal of the Water Pollution Control Federatio Vol 50, No 11, November 1978, p 2590-2601, fig, 3 tab, 16 ref.

Descriptors: *Water pollution effects, *Powe plants, *Chlorination, *Cooling water, *Californ Chlorine.

Chlorination frequency varied among five pow plants in Northern California from one per week four per day and duration of chlorination from 40 minutes per cycle. Oxidant residual determin at condenser inlets was the criterion used to dete mine chlorine dose level. As a result of mo precise measurements of residuals throughout t system, the chlorine dose was reduced to produ a residual of 0.5 mg C12/l at the condenser inle Results of in-plant studies and of decay and recei ing water studies at each of the five power plan (Contra Costa, Pittsburg, Potrero, Hunters Poi and Moss Landing) are detailed. (Chilton-ORN W79-01676

SEASONAL DYNAMICS OF CU2+, ZN2+ CA2+, AND MG2+ IN GONADS AND LIVE OF WINTER FLOUNDER (PSEUDOPLEU ONECTES AMERICANUS): EVIDENCE FO SUMMER STORAGE OF ZN FOR WINTE GONAD DEVELOPMENT IN FEMALES,
Memorial Univ. of Newfoundland, St. John Marine Science Research Lab.
G. L. Fletcher, and M. J. King.
Canadian Journal of Zoology, Vol 56, No 2, Fe ruary 1978, p 284-290, 3 fig, 1 tab, 24 ref.

Descriptors: Environmental effects, *Season Copper, Zinc, Calcium, Magnesium, Fish, Repr duction, Water pollution effects.

Feeding activity in flounder occurred from Ap through October during each year of the stu (1972-1976). Measurement of metals deposited the gonads indicated that substantially more Z

Cu, and Ca are deposited in the ovaries than in the testes and more Mg accumulated in the testes. Male gonads increased to approximately 16% of body weight in November and then declined to 10% of body weight by January. Ovaries increased to approximately 16% of body weight by February. Ovulation and spawning occurred in June. Ovaries continued to incorporate all four metals after the fish had stopped feeding. It was concluded that Zn and Cu requirements could have been released from the liver or other storage areas within the fish and that Cu, Ca, and Mg could have been absorbed from seawater. (Chilton-ORNL)
W79-01677

EFFECT OF ENVIRONMENTAL TEMPERATURE ON BIOSYNTHESIS OF LIVER PHOSPHATIDYL-CHOLINE IN THE TROUT (SALMO GAIRDNERII),
Lyon-1 Univ., Villeurbanne (France). Lab. de Physiologie Generale et Comparee.
G. Zwingelstein, N. A. Malak, and G. Brichon.
Journal of Thermal Biology, Vol 3, 1978, p 229-233, 4 tab, 27 ref.

Descriptors: Environmental effects, *Thermal pollution, Fish, *Trout, Lipids, Temperature, Biochemistry, *Water pollution effects.

The data demonstrate that the alteration in fatty acid composition of trout liver phosphatidyl-choline in response to environmental temperature reflects the differences in molecular species biosynthesis. Incorporation of P32 was found to take place more rapidly in the molecular species with high degree of unsaturation. Trout acclimated to 11 and 21C showed that temperature acclimation did not change the relative proportions of label shown in the five subfractions. Incorporation of C14-methyl-choline also took place more rapidly in unsaturated molecular species but it was found that increases in incubation temperature resulted in a decrease in the proportion of label in the unsaturated fractions. (Chilton-ORNL)
W79-01680

TEMPERATURE ADAPTATION IN THE FRESHWATER SNAIL, HELISOMA TRIVOLVIS (SAY),, IN AN ARTIFICIALLY HEATED RESERVOIR IN THE SOUTHEASTERN UNITED STATES,
Savannah River Ecology Lab., Aiken, SC.
D. H. Wood.
Journal of Thermal Biology, Vol 3, 1978, p 187-194, 7 fig, 2 tab, 18 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Snails, Temperature, Growth rates, Reproduction, Respiration, *South Carolina, Southeast US, Reservoirs.

Snails from an unheated area and from an area heated to 5C above normal by discharges from a nuclear production reactor were compared. Variation in metabolic-temperature responses was observed between animals from heated and unheated areas as well as between summer and winter generations. Snails from both areas produced three annual generations and spawning was synchronous except for a shorter mid-summer spawn in the heated area. Seasonal patterns of change in growth rates and in body weight relative to shell size were similar in the two areas. It was concluded that metabolic compensation is accompanied by homeostasis in other rate functions and can serve as indicators of present thermal adaptability but that they cannot give a complete indication of longterm adaptability because such patterns may change over an intermediate time span. (Chilton-ORNL)
W79-01681

OLISTHODISCUS LUTEUS (CHRYSOPHYCEAE) I. EFFECTS OF SALINITY AND TEMPERATURE ON GROWTH, MORTILITY AND SURVIVAL,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
C. R. Tomas.
Journal of Phycology. Vol 14, No 3, September 1978, p 309-313, 5 fig, 1 tab, 31 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, Phytoplankton, *Mortality, *Growth rates, Water pollution effects.

At a salinity range of 2-50%, O. luteus showed an increased tolerance to low salinities at higher temperatures. Growth response at low salinities and higher temperatures showed that sizable populations could be attained at 5%. At 5-50% salinity, variable but distinct optima for density, growth and motility were seen at 5, 10 and 30C. At lower salinities and temperatures, loss of mortality occurred. Loss of motility accompanied by low division rates appears to be partially responsible for reduced abundance under these environmental conditions. (Chilton-ORNL)
W79-01682

THE EFFECT OF TEMPERATURE AND BODY SIZE ON ELECTRON TRANSPORT SYSTEM ACTIVITY IN FRESHWATER ZOOPLANKTON,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
U. Borgmann.
Canadian Journal of Zoology, Vol 56, 1978, 634-642, 3 fig, 6 tab, 25 ref.

Descriptors: Environmental effects, *Seasonal, *Temperature, *Zooplankton, Freshwater, Oxidation, Reduction(Chemical), Size, Water pollution effects.

The rate of cytochrome c reduction by NADH, succinate, and NADPH in Mysis relicta, Limnocalanus macrurus, and surface zooplankton was measured as a means of determining electron transport system activity. No seasonal variation in reaction rates was observed for Mysis of Limnocalanus but activity in surface zooplankton was significantly higher for NADH and succinate oxidation in samples collected between March and May when surface temperatures ranged from 1.3 to 9.6C than in samples collected when surface temperatures were 22-24C. Larger organisms were found to have lower activity per unit weight than did smaller organisms. It was suggested that, since the effects of temperature and size are similar for NADPH oxidation and NADH or succinate oxidation, the ratio of NADPH to either NADH or succinate oxidation might be a useful indicator of exposure to toxic organic compounds. (Chilton-ORNL)
W79-01683

THE EFFECTS OF SHORT AND LONG TERM TEMPERATURE STRESS ON SEROTONIN, DOPAMINE AND NOREPINEPHRINE CONCENTRATIONS IN MOLLUSCAN GANGLIA,
East Coast Neuroscience Foundation, Inc., New York.
G. B. Stefano, L. Hiripi, and E. J. Catapane.
Journal of Thermal Biology, Vol. 3, 1978, p 79-83, 2 fig, 32 ref.

Descriptors: Environmental effects, *Thermal pollution, Seasonal, Temperature, *Mollusks, *Thermal stress, Water pollution effects, *Monoamines, Central nervous system.

Serotonin, dopamine and norepinephrine concentrations of the central nervous system were determined on groups of Mytilus edulis and Anodonta cygnea which had been acclimated to either cold (5C) or warm (17 or 20C) temperatures and then subjected to temperatures of 5, 17 or 20, 28C. Monamine metabolism was shown to be modified during temperature acclimation in both bivalves. Cold stress significantly reducedserotonin levels in both organisms over a long term period. As a result of cold stress dopamine significantly increased after 12 h and remained elevated in both organisms. As a result of warm stress dopamine levels rose in M. edulis only at the 10 day reading. Norepine-phrine levels increased over the short term period in both organisms as a response to both cold and heat stress. (Chilton-ORNL)
W79-01684

THE INFLUENCE OF CONSTANT AND CYCLIC ACCLIMATION TEMPERATURES ON THE METABOLIC RATES OF PANOPEUS HERBSTII AND UCA PUGILATOR,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
R. F. Dame, and F. J. Vernberg.
Biological Bulletin, Vol. 154, April 1978, p 188-197, 4 fig, 3 tab, 21 ref. NSF GA-36915.

Descriptors: *Environmental effects, *Temperature, *Crabs, Energy budget, Respiration, *Metabolism, Cycles, Water pollution effects, Cyclic temperatures, Constant temperatures.

Experimental data showed that the metabolic rate of the organisms studied was influenced differently by constant and cyclic temperature acclimation regimes. In Panopeus the most significant difference occurred in the 15-25C cycle. Crabs exposed to this cycle had a lower metabolic rate than animals exposed to a constant temperature of 25C. Respiratory responses of Uca to increasing cyclic temperature acclimation time were different than those of Panopeus and were highly variable. It was suggested that these organisms utilize energy more efficiently when subjected to natural cyclic temperature conditions than when subjected to constant temperature environments and that this difference in metabolic data would be significant in analyzing the role of yearly energy budgets in ecosystem energetics. (Chilton-ORNL)
W79-01685

VERTEBRAL VARIATION IN ZEBRAFISH (BRACHYDANIO RERIO) RELATED TO THE PREFERTILIZATION TEMPERATURE HISTORY OF THEIR PARENTS,
Manitoba Univ., Winnpeg. Dept. of Zoology.
W. Dentry, and C. C. Lindsey.
Canadian Journal of Zoology, Vol 56, 1978. p 280-283, 1 fig, 9 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Fish, Reproduction, Breeding, Fish genetics, Water pollution effects, *Zebrafish, Parental temperature history, Vertebral count.

Experimental results indicated that in offspring reared at the same temperature and produced by the same parents, vertebral counts differed depending upon the temperature at which the parents were being held at the time of laying. In all cases where differences between pairs were significant, vertebral count was higher in the sample originating from the higher parental holding temperature. It was concluded that even though interpretation of these results is complicated by differences among thermal responses of different breeding pairs, the existence of a parental temperature history effect on offspring vertebrae is strongly indicated and that such an effect should be looked for in other species of fish. (Chilton-ORNL)
W79-01687

SOME EFFECTS OF PHOTOPERIOD, TEMPERATURE, AND FOOD ON EMERGENCE IN THREE SPECIES OF CHIRONOMIDAE (DIPTERA),
Brock Univ., St. Catherines (Ontario). Dept. of Biological Sciences.
H. V. Danks.
The Canadian Entomologist, Vol 10, No 3, March 1978, p 289-300, 6 fig, 3 tab, 30 ref.

Descriptors: Environmental effects, *Temperature, *Diptera, Larvae, *Photoperiodism, *Food abundance, Water pollution effects.

Newly hatched larvae of Chironomus decorus, Endochironomus nigricans, and Chironomus staegeri were reared to adulthood at 15 and 20C and 16 and 8 h daily photoperiods. C. decorus required 26 days at 20C and 37 days at 15C for normal development to EM50; E. nigricans required 35 days at

20C and 48 days at 15C; and C. staegeri required 68 days at 20C. Emergence was inhibited in 8 h daily photoperiods at both temperatures for E. nigricans and C. staegeri and at 15C for C. decorus. Some few individuals emerged even under these adverse conditions. It was suggested that small percentages of atypical individuals might buffer populations in years of unusual environmental conditions. Moderate reduction of food did not appear to greatly alter the initial emergence pattern compared with fully fed chambers, but it did delay the development of some individuals and increased mortality. (Chilton-ORNL)
W79-01688

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Inst., MA.
G. D. Grice, and D. W. Menzel.
Marine Science Communications, Vol. 4, No. 1, 1978, p 23-31, 10 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, Bacteria, Plankton, Fish, Copepods, Sediments, Bioassay, Ecosystems.

This paper summarizes the results of previously reported experiments on the reactions to mercury of plankton communities maintained in 1300 cubic meter plastic enclosures for a period of 72 days. A significant decrease in bacterial biomass occurred within one day after addition of mercury followed by a recovery to control levels within 7 days. A similar reduction and recovery was seen in counts of viable colonies of bacteria. Phytoplankton productivity decreased for a period of 12 days following mercury addition. Naupliar copepods were significantly reduced in abundance and showed little signs of recovery for 34 days. Growth of chum salmon was reduced. This appeared to be related to decreased food supply rather than direct effect of mercury. Total mercury concentration in solution and suspension decreased at a rate of about 3%/day during the time of the experiment. 90% was recovered in sediment at the close of the experiment. (Chilton-ORNL)
W79-01691

BACTERIAL AEROSOLS FROM COOLING TOWERS,
Army Dugway Proving Ground, UT.
A. P. Adams, M. Garbett, and B. G. Lewis.
Journal Water Pollution Control Federation, Vol 50, No 10, 1978, p 2362-2369, 4 tab, 30 ref.

Descriptors: Environmental effects, *Water pollution sources, *Air pollution effects, Powerplants, *Cooling water, *Bacteria, Chlorination, *Aerosols.

The Burbank, California municipal electrical generating plant, which uses wastewater effluent for makeup water, was chosen for this study. Samples were taken for analysis at a six month interval. During this time the method of chlorination was switched from gaseous chlorine to chlorine dioxide. Total bacteria counts in the water of the cooling-tower basin differed by a 1000-fold reduction after the use of chlorine dioxide was introduced. A drastic reduction also occurred in the count of the viable bacteria-bearing particles exiting into the air via the cooling-tower vents. It was concluded that the aerosol count of bacterial particles expelled from the cooling tower would offer no significant cause for concern for people downwind of the cooling tower. (Chilton-ORNL)
W79-01694

EFFECTS OF CHLORINATION ON DIFFERENTIATED COLIFORM GROUPS,
Tufts Univ., Medford, MA.
E. C. Kinney, D. W. Drummond, and N. B. Hanes.
Journal Water Pollution Control Federation, Vol. 50, No. 10, 1978, p 2307-2312, 2 fig, 6 tab, 15 ref. Pub. Health 3A04AH 00717-0151.

Descriptors: Environmental effects, *Water pollution effects, *Chlorination, *Bacteria, *Coliforms, Animal growth.

The purpose of this study was to investigate the phenomenon of apparent regrowth of three major coliforma subgroups (Escherichia coli, Klebsiella spp., and Enterobacter-Citrobacter spp.) in a chlorinated wastewater effluent. It was suggested that the mechanism causing the increasing bacterial numbers after chlorination is recovery of damaged cells rathen than growth of surviving cells. It was concluded that the bacterial behavior observed raises doubts about the need for chlorination of a well-treated effluent in which bacterial death occurs without disinfection. Results also suggest that a delayed bacterial analysis of stored samples should be used for the evaluation of the efficiency of the chlorination procedure. (Chilton-ORNL)
W79-01695

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEMATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
J. G. T. Carter, and W. L. Nicholas.
Australian Journal of Marine and Freshwater Research, Vol. 29, No. 3, June 1978. p 299-309, 3 fig, 4 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Metals, *Zinc, *Diptera, *Absorption, Toxicity, Larvae.

Experimental results showed that S. ornatipes larvae exposed to zinc absorb appreciable amounts of the metal. An increase in calcium ion concentration reduced the toxicity of zinc to the larvae but had no effect on the uptake from high or low concentrations or on the loss of zinc. Fractionation of larvae into cuticle, high- and low-molecular-weight fractions showed that in the cuticle and high-molecular-weight fractions two pools may be identified. In one pool, zinc is weakly held and exchanges rapidly with the zinc in solution. In the other, zinc is held and exchanges slowly. The quantity of zinc entering these pools was influenced by exposure time, temperature and concentration. Data indicated that zinc was bound by phenolic groups in the cuticle fraction and by phosphonic acids in the high-molecular-weight fraction. (Chilton-ORNL).
W79-01696

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
S. J. E. Slater, and A. J. Boag.
Australian Journal of Marine and Freshwater Research, Vol 29, No 3, June 1978, p 263-274, 2 fig, 4 tab, 23 ref.

Descriptors: Environmental effects, *Water pollution effects, Sedimentation, *Phosphorus, *Lake sediments, *Victoria, Lakes, *Australia.

Sediments from Lakes Burrumbeet, Learmonth, and Colac in Victoria were analyzed for phosphorus, iron, and aluminum. Lake Colac contained the highest levels of all forms of sediment phosphorus (Total P - 378-527 mg/kg, Inorganic P - 353-418 mg/kg, Organic P - 11-173 mg/kg) as well as the greatest potential for the release of dissolved reactive phosphorus to the overlying water. Correlations between the sediment parameters amorphous iron and inorganic phosphorus which have been reported for other lakes were not found to be applicable to the data gathered in this study. (Chilton-ORNL)
W79-01697

STREPTOCOCCUS SP. FROM MARINE FISHES ALONG THE ALABAMA AND NORTHWEST FLORIDA COAST OF THE GULF OF MEXICO,
Auburn Univ., AL. International Center for Aquacultures.
J. A. Plumb, J. H. Schachte, J. L. Gaines, W. Peltier, and B. Carroll.
Trans Am Fish Soc. 103(2), p 358-361, 1974.

Descriptors: *Alabama, Coasts, Fishes, *Florida, *Gulf of Mexico, Marine environment, *Streptococcus sp.

Fish kills in estuarine bays along the Florida and Alabama (USA) Gulf Coast were investigated in August and September 1972. Eight species of moribund fish were examined. A nonhemolytic, group B, type Ib Streptococcus sp. was isolated from over 90% of the fish examined. Parasites and toxicants were eliminated as possible causes of the kills. Copyright 1974, Biological Abstracts, Inc
W79-01698

THERMAL ACCLIMATION INDUCED COMPENSATION IN BIOCHEMICAL CONSTITUENTS OF THE INDIAN FRESHWATER LEECH, POECILOBDELLA VIRIDIS (BLANCHARD),
Marathwada Univ., Aurangabad (India). Dept. of Zoology.
G. K. Kulkarni, and R. Nagabhushanam.
Hydrobiologia, Vol 58, No 1, 1978, p 3-6, 1 tab, 29 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Temperature, Aquatic animals, Biochemistry, *Leeches.

Changes in water, glycogen and protein content during thermal acclimation (warm and cold) were determined from the whole body tissues of a group of ten leeches. The percentages of water and glycogen both decreased significantly during both acclimation processes and protein percentage increased significantly. The paper includes a discussion on the ecophysiological significance of these changes in counteracting ambient thermal fluxes. (Chilton-ORNL)
W79-01700

STUDIES ON THE MYTILUS EDULIS COMMUNITY IN ALAMITOS BAY, CALIFORNIA. VII. THE INFLUENCE OF WATER-SOLUBLE PETROLEUM HYDROCARBONS ON BYSSAL THREAD FORMATION,
California State Univ., Long Beach. Dept. of Biology.
R. S. Carr, and D. J. Reish.
The Veliger, Vol 21, No 2, October 1978, p 283-287, 3 tab, 14 ref.

Descriptors: Environmental effects, *Water pollution effects, Oil pollution, *Mussels, Organic compounds, *Oil wastes, *California, *Alamitos Bay(Calif).

Mytilus edulis ranging in width from 18 to 23 mm were exposed to varying concentrations (25, 50, 75, and 100%) of the water-soluble fraction (WSF) of No. 2 fuel oil, South Louisiana crude oil and Sta-lube outboard motor oil. Byssal thread production was significantly inhibited at the 100% level for all three oils. South Louisiana crude oil showed the greatest inhibitory influence on a percent WSF basis and Sta-lube the least effect. Significant enhancement of byssal thread formation was observed for all three WSFs at concentrations lower than those at which an inhibitory effect was produced. (Chilton-ORNL)
W79-01701

BDELLOVIBRIO AND THE INTESTINAL FLORA OF VERTEBRATES,
Auburn Univ., AL. Dept. of Microbiology.
For primary bibliographic entry see Field 5F.
W79-01742

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.

D. K. Lawrence.
Rhodora, Vol. 78, No. 816, p 739-749, December 1976. 3 tab, 21 ref. OWRT A-042-MASS(3), 14-31-0001-5021.

Descriptors: *Aquatic weeds, *Bioindicators, *Plant morphology, Aquatic plants, Eutrophication, *Massachusetts, Elodea canadensis, Elodea nuttallii.

Elodea canadensis and E. nuttallii have a potential use as indicators of pollution and are economically important plants because of their occurrence as troublesome waterweeds. Due to infrequent and brief flowering periods, leaf morphology (and particularly leaf width) is often used to differentiate these species. A tank experiment was designed to test the effects of elevated temperatures, comparable to those attained in some field situations, on the vegetative morphology of typical E. canadensis. Leaf width was reduced at higher temperatures and leaves were produced which fell within the reported range of E. nuttallii. Accepted taxonomic criteria for distinguishing E. canadensis and E. nuttallii are not satisfactory in determining four of 10 naturally occurring populations sampled in western Massachusetts. (Godfrey-Mass)
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
C. J. Burk, S. D. Lauermann, and A. L. Mesrobian.
Rhodora, Vol. 78, No. 816, p 727-767, December 1976 17 ref. OWRT A-042-MASS(4), 14-31-0001-5021.

Descriptors: *Aquatic plants, *Aquatic weeds, Eutrophication, Water pollution effects, Marsilea quadrifolia L. Wolffia columbiana(Karst), Trapa natans L., Cabomba carolininana(Gray), *Massachusetts.

Changes in the distributional status of several recently introduced or invading vascular plant species have been observed during the present century. Water colver, Marsilea quadrifolia L. has become established since 1945 along two miles of the Mill River in Northampton, Massachusetts, and successfully invaded the Arcadia Wildlife Sanctury marsh during a period of disturbance. Watermeal, Wolffia columbiana (Karst) unknown in the area prior to 1933, is now abundant in highly eutrophic lakes and impoundments which receive sewage effluents. Water chestnut, Trapa natans L. has reached pest densities in Upper and Lower Ponds on the Mount Holyoke College campus in South Hadley and has escaped to form a colony downstream in Stoney Brook. Cooter-grass, Cabomba caroliniana (Gray), first detected in Massachusetts in 1930, has spread to several other western Massachusetts sites and is the dominant submerged aquatic plant life in Lake Rohunta in Franklin and Worcester Counties. Each of these species occurs in sites affected by some form of habitat disruption; none is yet so widespread as to be regularly encountered in freshwater systems. (Lefferts-Mass)
W79-01744

GENETIC DAMAGE TO A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: SEGREGATION AND DESCRIPTION OF GAMETOPHYTE MUTANTS,
Massachusetts Univ., Amherst. Dept. of Botany.
E. J. Klekowski, Jr., and E. L. Davis.
Canadian Journal of Botany, Vol. 55, No. 5, p 542-548, 1977, 6 fig, 2 tab, 14 ref. OWRT B-053-MASSZ(3), 14-34-0001-6087.

Descriptors: *Ferns, *Genetics, Water pollution effects, Plant populations, *Riparian plants, Rivers, *Massachusetts, *Osmunda regalis, *Mutants, *Millers River(Mass).

A population of the fern Osmunda regais growing in a polluted river was investigated genetically. Previous studies documented a high frequency of postzygotically induced genetic and chromosome damage. This paper describes two categories of gametophytic mutants which occurred in the progeny of this population. A gametophyte phenotype which exhibited a maternal effect on the sporophyte generation when it was the female parent occurred in 7.8% of the spore sample. A gametophyte phenotype which could best be characterized as a neuter calluslike mass occurred in 6.6% of the spore sample. Studies of nearby O. regalis populations in non-polluted sites failed to document the presence of such phenotypes in the spore samples. (Godfrey-Mass)
W79-01745

MICROFLORAL RESPONSE TO AQUATIC WEED DECOMPOSITION,
Massachussets Univ., Waltham. Dept. of Environmental Sciences.
J. Rho, and H. B. Gunner.
Water Research, Vol. 12, p 165-170, 1978. 5 fig, 3 tab, 21 ref. OWRT B-058-MASS(1), 14-34-0001-7161.

Descriptors: *Aquatic weeds, *Eutrophication, Microflora, *Aquatic algae, Nutrients, *Decomposing organic matter, Chlorophyta, *Nitrates, *Nitrites, *Phosphates, *Myriophyllum heterophyllum, *Water milfoil.

Microfloral response to the liberation of N and P from decomposing water milfoil tissue (Myriophyllum heterophyllum) was determined under various laboratory conditions. The death and decay of the macrophyte released ammonia and phosphate in concentrations sufficient to promote algal growth. The oxidation of ammonia by resident nitrifiers exercised a striking impact on microflora succession. Nitrification was accompanied by a decrease in pH and thereafter by a decline in the numbers of bacteria and protozoa. Subsequently, coincident with the accumulation of nitrite and nitrate, the numbers of the resident green algal communities rose dramatically. These results, coupled with field observations, indicate that nutrient released by decomposing aquatic weeds and the changes attendant upon nitrification are of significance in the distribution and abundance of aquatic microflora. (Godfrey-Mass)
W79-01746

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
W. W. Sage, and M. J. Sullivan.
Journal of Phycology, Vol. 14, No. 3, p 333-337, September 1978. 1 fig, 4 tab, 15 ref. OWRT A-099-MISS(3), 14-34-0001-7052.

Descriptors: *Cyanophyta, *Salt marshes, *Soil algae, *Biological communities, *Ecological distribution, Biogeography, Light intensity, Bulrush, *Mississippi, *Graveline Bay Marsh(Miss), Community structure, Schizothrix, Spartina, Juncus, Distichlis.

Edaphic bluegreen algal communities were sampled from five monotypic angiosperm zones in Graveline Bay Marsh near Ocean Springs, Mississippi. Samples and environmental data were taken quarterly from October 1976 to June 1977 beneath the following angiosperms: Distichlis spicata (L.) Greene, Scirpus olneyi Gray, Spartina patens (Aiton) Muhl., S. alterniflora Loisel., and Juncus roemerianus Scheele. Results showed that communities in all five zones of the marsh were dominated by Schizothrix calcicola (Ag.) Gom. throughout the year, while subdominants varied according to season. The number of individuals in all zones was greatest in the summer and lowest in the winter. An examination of the structure of the five edaphic communities indicated a single, nearly homogeneous community exists over the entire surface of the marsh shaded by an angiosperm canopy. Light intensity appears to be the major factor affecting the distribution of bluegreen algae in this salt marsh. The results of this study are in agreement with those conducted in other North Atlantic temperate salt marshes.
W79-01750

THE EFFECTS OF INTERMITTENT CHLORINATION ON COHO SALMON, ALEWIFE, SPOTTAIL SHINER, AND RAINBOW SMELT,
Wisconsin Univ., Milwaukee. Dept. of Zoology; and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
G. L. Seegert, and A. S. Brooks.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 346-353, 1978. 4 tab, 20 ref.

Descriptors: *Freshwater fish, *Chlorination, *Shiners, *Smelts, Salmon, Mortality, Water temperature, Water quality, Environmental effects, Lethal limit, Resistance, Laboratory tests, Bioassay, *Coho salmon, *Alewife, Spottail shiner, Rainbow smelt.

Coho salmon, alewife, spottail shiner, and rainbow smelt were exposed for 30 min to residual chlorine. The alewifes were tested at 10, 15, 20, 25, and 30C, the salmon and shiners at 10, 15, and 20C and the smelt at 10C. Thirty minute LC50 values were both species and temperature dependent. All species showed an inverse relationship between test temperatures and LC50 values. Mortalities usually occurred within 24 h after exposure. Except for the 10-C spottail shiner, fish rarely recovered, following loss of equilibrium. Concentrations resulting in no mortality were 0.6-0.7 of the LC50 value. (EIS-Klein)
W79-01753

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS, VOL. I. WORKING GROUP RESULTS,
Sigma Research, Inc., Richland, WA.
R. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 760, Price codes: A07 in paper copy, A01 in microfiche. Report to Electric Power Research Institute, Palo Alto, California, April, 1976. 122 p, 2 tab, 10 fig.

Descriptors: *Thermal pollution, *Thermal power, *Thermal power plants, Thermal stress, Thermal water, *Water pollution effects, Ecology, Cooling water, Cooling towers, Water pollution sources, Aquatic environment, Aquatic habitats, *Entrainment, Chemical discharge, *Waste heat management, *Ecosystem characterization.

The Electric Power Research Institute (EPRI) sought to determine the current high-priority research needs which have broad application to defining aquatic power plant impacts. Through an advisory workshop on the Impact of Power Plant Cooling Systems on Aquatic Environments held at Pacific Grove, California, in late September, 1975. This workshop brought together about 30 highly knowledgeable scientists and engineers who were representatives of academia, government, industries, and consulting firms. Projects recommended: and include: (1) population, community, ecosystem effects of reduced survival or changes in distribution; (2) chemical/physical studies; (3) intake effects (near field); (4) ecosystem management; (5) entrainment damage; (6) ecosystem characterization; (7) discharge effects; (8) waste heat management; (9) standardization of methods; (10) information synthesis and evaluation; and (11) information center. Volume I includes the deliberations of the workshop and the research recommendations made. (EIS-Katz)
W79-01755

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON CADMIUM,
National Environmental Research Center, Research Triangle Park, NC.
For primary bibliographic entry see Field 5A.
W79-01756

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
R. B. Juul, and J. V. Shireman.
Water Research, Vol. 12, No. 9, p 691-701, 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Pulp wastes, *Aquatic life, Fish growth, *Waste water disposal, *Environmental effects, Effluents, Oxidation lagoons, Pulp and paper industry, Diptera, Benthic fauna, Aquatic productivity, Fish diets, Catfishes, Water pollution effects, Industrial wastes.

Studies were performed from June 1974 to September 1975 at the waste water treatment facility of the Hudson full bleach pulp mill near Palatka, Florida, to survey naturally-occurring fish and benthic populations within a kraft pulp mill effuent (channel). After treatment by a primary clarifier and a series of four oxidation ponds, the effluent is discharged through a cement riffleway into an 0.5-0.7 m deep earthen channel. Benthic organisms in the channel were dominated by chironomid larvae whose relative distribution and abundance varied with respect to the channel flow rate and substrate characteristics; concentrations were highest on clay bottom slopes within 1 m of shore. Dissolved oxygen, temperature, pH, flow rate, and BOD were also measured in the channel throughout the study period. A total of 25 species of fish were collected within the channel; some of these fish appeared to be permanent residents and others appeared seasonally, although spawning was never observed. Chironomid larvae were utilized as a food source by both brown bullheads and white catfish. Mosquitofish, the predominant foragers in the channel, were consumed along with coleopterans by larger fish. The growth rates of white catfish and warmouth in the effluent channel were at least comparable to that expected for natural waters. (Schulz-FIRL)
W79-01774

IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: REFORMING THE IMPACT ASSESSMENT PROCESS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
For primary bibliographic entry see Field 6G.
W79-01783

EFFECTS OF CRUDE OILS ON THE GROWTH OF ARCTIC MARINE PHYTOPLANKTON,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Artic Biological Station.
S. I. C. Hsiao.
Environmental Pollution, Vol 17, No 2, p 93-107, October 1978. 7 fig, 1 tab, 23 ref.

Descriptors: *Phytoplankton, *Arctic, *Water pollution effects, *Oil pollution, Resources development, Cold regions, Environmental effects, *Oil wastes, *Outer Continental Shelf, *Crude oil, Oil spills, Species sensitivities, Differential growth.

Growth response of arctic marine phytoplankton to crude oils were determined at various temperatures and exposures in a defined medium at constant light energy. The growth of diatoms (Chaetoceros septentrionalis Oestrup, Navicula bahusiensis (Grunow in van Heurck) Grunow and Nitzchia delicatissima Cleve) was inhibited by Atkinson Point, Norman Wells, Pembina and Venezuela crude oils after ten days' exposure at a concentration of 10 ppm at 0C, 5C and 10C. Growth of the green flagellate Chlamydomonas pulsatilla Wohlenweber was stimulated by Norman Wells and Pembina crude oils at 0C. Growth of both diatoms and the green flagellate was markedly inhibited by oil concentrations higher than 100 ppm but diatoms were more severely impaired than the green flagellate. Greater inhibition generally occurred with longer exposure at temperatures between 5C and 10C than at 0C. Chlamydomonas was not killed by any of the crude oils at the concentrations, temperatures and lengths of exposure tested. Lethal effects among diatoms varied with species, types of oil, temperatures and exposure time. Relative species sensitivity of the phytoplankton to the oils was determined based on percentage survival, exponential growth rate and generation time. Chlamydomonas was the most tolerant species and had a greater ability to resume growth, while diatoms were sensitive and had little or no ability to resume growth. Possible ecological consequences of such species sensitivity and differential growth are discussed. (Sinha-OEIS)
W79-01784

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
Texas General Land Office, (Austin), 15 September 1978. 143 p, 17 fig, 12 tab, 5 append.

Descriptors: *Environmental effects, *Resources development, *Ecology, *Texas, Water pollution effects, Coasts, Data processing, *Outer Continental Shelf, Manuals, Environmental impact.

The Ecological Systems Component (ESC) provides the mechanism for estimating environmental effects of development activities in the Texas Coastal region, though the methodology is not limited to coastal ecosystems. This User's Manual provides a natural scientist with step by step instructions for the documentation of an environmental assessment. It is supplemented by a variety of technical papers. The ESC is, in essence, a simple system of documenting the series of professional judgments which make up all environmental assessments. The length of an assessment using the ESC is determined by the complexity of the activity analyzed and the complexity of the ecosystems where the activity is to occur. The complex issue raised by the ESC is how the 'significance' or 'importance' of an impact on a biological system is to be defined and measured. While this manual makes suggestions on how the magnitude and probability of impacts can be defined, it leaves the definition of these terms to the professional judgment of scientists and policy-makers. (Sinha-OEIS)
W79-01787

MARINE BIOLOGICAL EFFECTS OF OCS PETROLEUM DEVELOPMENT,
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
D. A. Wolfe.
NOAA Technical Memorandum ERL OCSEAP-1, September 1978. 332 p, numerous fig, tab, ref. NOAA-TM-OCSEAP-1.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, *Alaska, Research priorities, Reviews, *Outer Continental Shelf, Petroleum hydrocarbons, Biological effects.

This document contains the proceedings of the first formal scientific review of the Biological Effects Studies managed by NOAA's Outer Continental Shelf Environmental Assessment Program (OCSEAP). The review was conducted November 29-December 1, 1977 at the Northwest and Alaska Fisheries Center in Seattle, Washington. The projects, managed by NOAA/OCSEAP, fall into two categories, based on the sources of financial support: Bureau of Land Management Environmental Studies Program in support of OCS leasing for Alaskan oil and gas development (Part I of Proceedings); NOAA's Energy Resources Project on Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms, which is part of the Federal Interagency Energy/Environment Program, funded through the Environmental Protection Agency (Part II of Proceedings). Part II of the Proceedings contains discussions of selected topics addressed at the Review and a brief synopsis of general comments received from the invited outside reviewers. (Author extracted)
W79-01788

OCSEAP: AN OVERVIEW AND A CONTEXT FOR STUDIES ON BIOLOGICAL EFFECTS,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
D. A. Wolfe.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 1-10, 2 fig, 4 tab, 5 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, Alaksa, *Outer Continental Shelf, Biological effects, Petroleum hydrocarbons.

The Bureau of Land Management (BLM) initiated an extensive marine environmental studies program in response to national needs to assess the potential effects of OCS oil and gas development and to protect the environment. Through the offices of the Outer Continental Shelf Environmental Assessment Program (OCSEAP), the National Oceanic and Atmospheric Administration is planning and conducting for BLM that portion of the environmental studies program applicable to the OCS of Alaska. For each lease area, OCSEAP has implemented a studies program designed to facilitate the assessment of potential OCS-related impacts. The studies program addresses six major tasks or questions, which together will enable BLM to proceed with OCS leasing, while minimizing the environmental risks of subsequent oil and gas development. (See also W79-01788) (Sinha-OEIS)
W79-01789

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION, AND SUBLETHAL RESPONSE OF ALASKA MARINE ORGANISMS TO PETROLEUM HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
S. D. Rice, J. F. Karinen, and S. Korn.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 11-24, 22 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Toxicity, *Baseline studies, Fish, Shellfish, Alaska, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, Fuel oil, Sublethal effects.

Oil effects studies at the Auke Bay Laboratory began in late 1971, however this report describes progress associated with OCSEAP funding which began in the last 2 months of FY 75, and draws primarily from published or drafted manuscripts. The studies can be broken down into two basic themes: (1) Toxicity challenge experiments, where an attempt is made to identify sensitive species, life stages, facotrs that affect toxicity, or components that are most responsible for toxicity; and (2) sublethal physiological response, where an attempt is made to identify, measure, and characterize physiological responses that are indicative of oil stress. Results from the series of sublethal effects studies may have application to monitoring effects of oil and defining the mode of action of toxicants. (See also W79-01788) (Sinha-OEIS)
W79-01790

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, PHYSIOLOGICAL, PATHOLOGICAL, AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins, E. H. Gruger, H. O. Hodgins, N. L. Karrick, and D. D. Weber.
In: NOAA Techn Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' Sept 1978. p 25-40, 2 fig, 1 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Toxicity, Alaska, Metals, Biochemistry, *Heavy metals, *Oute Continental Shelf, Petroleum hydrocarbons, Trace metals, Sublethal effects.

significant body of evidence has been accumu-
ted to indicate that aromatic hydrocarbons are
pidly and progressively converted to metabolites
the pelagic and demersal fish and in invertebrate
rval forms. The literature on animal systems in
eneral affirms the concept that extremely low
vels of arene oxides are damaging to biological
stems in many ways, which includes their strong
utagenic and carcinogenic potential. The tenden-
of starry flunder to accumulate high propor-
ons of metabolites in skin is of interest with
spect to their known susceptibility to lesion for-
ation in this tissue. Evidence presented for the
le of mucus in the excretion of naphtahlene and
etabolites in fish suggests that such exudates must
considered along with other routes of elimina-
on which lead to the recycling of petroleum and
etabolic products in the marine environment.
he findings to day imply that the pelagic species
ay be less susceptible to accumulating aromatic
drocarbons from the environment than the de-
ersal species, although a wider variety of differ-
t organisms must be studied in each class to
rify this hypothesis. (See also W79-01788)(Sinha-
EIS)
79-01791

IOLOGICAL FATE OF METALS IN FISH,
ational Marine Fisheries Service, Seattle, WA.
orthwest and Alaska Fisheries Center.
Varanasi.
: NOAA Technical Memorandum ERL
CSEAP-1, 'Marine Biological Effects of OCS
troleum Development,' September 1978. p 41-
, 1 fig, 4 tab.

escriptors: *Oil pollution, *Water pollution ef-
cts, *Toxicity, *Baseline studies, *Arctic, Alaska,
sh, Lead, Cadmium, Metals, Salmon, Flounder,
Outer Continental Shelf, Trace metals, Oncor-
nchus kisutch, Platichthys stellatus.

obtain the most comprehensive and in-depth
aluation of the impact of trace metals on arctic
d subarctic organisms, the investigation was car-
d out in three separate phases: (1) Biochemical
eractions of trace metals in fish which dealt with
tterns of uptake, accumulation, and retention of
d and cadmium in key tissues of fish exposed to
w levels of water-borne metals at 4 degree and
degrees C (Subcellular distribution of metals as
ll as mechanisms of excretion were also stud-
); (2) evaluation of importance of skin and epi-
rmal mucus in metabolism and excretion of
tals which defines uptake, accumulation and
scharge of trace metals from epidermal mucus,
n, and scales of fish; and (3) influence of metal
posure on hydrocarbon metabolism in fish. This
dy was initiated to assess alterations in the pro-
es of metabolites of hydrocarbons (e.g., naphtha-
ne) in tissues of fish exposed to lead and cadmi-
n. (See also W79-01788) (Sinha-OEIS)
79-01792

**HE EFFECTS OF ALASKAN CRUDE OIL ON
ATFISH, AND THE PREVALENCE OF FISH
ATHOLOGY IN ALASKAN MARINE
ATERS.**
ational Marine Fisheries Service, Seattle, WA.
orthwest and Alaska Fisheries Center.
B. McCain.
NOAA Technical Memorandum ERL
CSEAP-1, 'Marine Biological Effects of OCS
troleum Development,' September 1978. p 54-
12 fig.

escriptors: *Oil pollution, *Water pollution ef-
cts, *Baseline studies, *Fish diseases, Alaska, Pa-
ology, *Outer Continental Shelf, Flatfish, Crude

ata from two separate studies are presented. One
dy concerns the long-term pathological effects
exposing flatfish to sediments contaminated with
askan crude oil, and the other deals with the
evalence, distribution, and pathology of disease
demersal fishes in the Bering Sea, Gulf of
aska, Norton Sound, and Chukchi Sea. The
thological effects of crude oil-contaminated sedi-
nts on flatfish were investigated by a multidisci-
plinary effort involving the fields of pathology, analytical chemistry, fishery biology, and electron microscopy. In addition to identifying the types of pathological conditions in Alaskan marine fish and their prevalence and geographical distribution, the baseline study included efforts to determine the cause(s) of these conditions. The principal contribution of these baseline studies has been the demonstration that significant frequencies of disease are presently in the demersal fish populations associated with Alaska's Outer Continental Shelf. The studies have also provided information concerning the species free of detectable disease and those species affected by specific diseases, the geographic distribution of affected fish, and the possible causes of some of the diseases. (See also W79-01788) (Sinha-OEIS)
W79-01793

PHYSIOLOGICAL AND BEHAVIORAL EFFECTS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
H. O. Hodgins.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 72-86, 4 fig, 5 tab.

Descriptors: *Water pollution effects, *Oil pollution, *Baseline studies, *Physiology, Animal behavior, Salmonids, Alaska, Arctic, *Outer Continental Shelf, Petroleum hydrocarbons, Disease resistance, Oncorhynchus, Pandalus platyceros, Onchidoris, Salmo, North Pacific Ocean.

Physiological and behavioral studies were designed as laboratory experiments--with the notable exception of field studies of salmon homing--to evaluate effects of sublethal petroleum exposure on species indigenous to the North Pacific Ocean tested under natural water quality and temperature conditions. The studies have provided clear implications that in certain instances heavy exposures of fish to the petroleum have little effect on physiology; whereas, in other instances, severe effects may result from light to moderate exposures to petroleum. In the category of 'severe exposure--little effect' are the studies of oil in the diet on trout reproduction, and the disease resistance research with salmon and trout. In both of these studies high doses of crude oil in diets induced little or no detectable physiological impairment. Conversely, exposure of spot shrimp and dorid nudibranchs to ppb levels of petroleum in seawater resulted in potentially disastrous effects on feeding behavior, reproductive behavior, or embryogenesis. Other studies, such as effects of petroleum on salmon migration, may fall somewhere between the above two extremes. (See also W79-01788) (Sinha-OEIS)
W79-01794

MORPHOLOGY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
J. W. Hawkes.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 87-92, 1 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Morphology, *Toxicity, Salmonids, Fish, Alaska, Arctic, *Outer Continental Shelf, Petroleum hydrocarbons, Environmental stress, Flatfish, Prudhoe Bay, Crude oil.

The two major objectives are to identify the effects of petroleum on fish at the cellular level and to establish which tissues show that most obvious and repeatable structural alterations. A series of experimental designs have been followed to assess the effects of Prudhoe Bay crude oil or its water-soluble fraction on both pelagic and demersal species and on adult and young. The findings are reported by considering each major target organ and describing the alterations observed for each type of experiment and variation. The common theme is the type of cellular response of selected organs or tissues to toxic substances; namely, petroleum hydrocarbons. The observed liver changes parallel hepatic alterations known for other animals to be pre-neoplastic. These changes indicate that the ability of fish to survive additional routine environmental stress may be reduced because of depletion of energy reserves or reduced liver functions. (See also W79-01788)(Sinha-OEIS)
W79-01795

OVERVIEW,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development' September 1978. p 92-105.

Descriptors: *Water pollution effects, *Oil pollution, *Baseline studies, *Heavy metals, Alaska, Arctic, Invertebrates, Bibliographies, *Outer Continental Shelf, Petroleum hydrocarbons.

Results of a number of studies indicate that many marine invertebrates, particularly larval forms, are highly susceptible to petroleum pollution. Research on the biological fate of aromatic hydrocarbons in larval invertebrates has shown that these developmental stages can substantially bioconcentrate aromatic hydrocarbons from the water column. The feeding and reproductive behavior of two marine invertebrates, shrimp and nudibranchs, and the embryonic development of nudibranchs, also appear to be particularly sensitive to low levels of petroleum hydrocarbons in seawater. Studies on the biologica fate of heavy metals in arctic and subarctic marine organisms reveal that metals are bioconcentrated, and accumalate in certain organs. Slight elevations in concentrations to toxic metals above levels found in seawater can alter the metabolism of aromatic hydrocarbons. This finding support the hypothesis that increases in metal present in polluted environments, possibly arising from petroleum operations, may significantly alter the biological fate of aromatic hydrocarbons in marine organisms. (See also W79-01788) (Sinha - OEIS)
W79-01796

TRANSPORT, RETENTION, AND EFFECTS OF THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL IN EXPERIMENTAL FOOD CHAINS,
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
J. A. Whipple, T. G. Yocom, P. E. Benville, D. R. Smart, and M. H. Cohen.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 106-129, 6 fig, 6 tab, 8 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Food chains, Baseline studies, Alaska, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, Cook Inlet.

The objectives of this study are to determine the accumulation and passage of petroleum constituents in experimental marine food chains and the effects of petroleum exposure on the test organisms. The methods and apparatus of the experiments are described and the results of the three experiments are given. (See also W-79-01788) (Sinha - OEIS)
W79-01797

BIOAVAILABILITY OF HYDROCARBONS AND HEAVY METALS TO MARINE DETRITIVORES FROM OIL-IMPACTED SEDIMENTS,
Battelle Pacific Northwest Lab., Sequim, WA. Marine Research Lab.
J. W. Anderson, G. Roesijadi, and E. A. Crecelius.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 130-148, 1 fig, 8 tab, 30 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Sediments, Baseline studies, Heavy metals, Benthos, Alaska, *Outer Continental Shelf, Hydrocarbons, Petroleum hydrocarbons, Detritivores, Protothaca staminea, Macoma inquinata, Phascolosoma agassizii.

Studies were conducted to assess the potential damage of oil-contaminated marine sediments on benthic organisms and the availability of this material to marine food-webs and eventually man. There appears to be a tissue accumulation pattern associated with the molecular weight of the petroleum hydrocarbon, which is probably dependent on relative partitioning coefficients. From other studies it seems that tissue retention times, while animals are in clean water, increases with the size of the hydrocarbon, and the number of side chains (alkylation). No single study with one organism and one type of system has been conducted to produce these data, but the basic pattern appears to exist. Present evidence indicates that hydrocarbons bound to sediment particles are not directly available to deposit/detritus-feeding organisms. (See also W79-01788)
W79-01798

ACTIVITY-DIRECTED FRACTIONATION OF PETROLEUM,
Battelle Memorial Inst. Columbus, OH.
J. S. Warner.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 149-155, 2 fig, 1 tab, 7 ref.

Descriptors: *Oil pollution, *Water pollution effects, Baseline studies, Alaska, *Outer Continental Shelf, Petroleum, Petroleum hydrocarbons, Crude oil, Fractionation.

The program on activity-directed fractionation of petroleum is in its formative stage so there are no results yet to present and discuss. This presentation describes the basis for the program, its objectives, and the research plan. Generally the chemical analyses are limited to the determination of components that can be detected most easily, the volatile and semivolatile hydrocarbons that can be detected by gas chromatography. Unfortunately petroleum is also comprised of many other components including nonvolatile and polar components. The research program is designed to assess the potential biological activity of these generally ignored petroleum components. Since normal paraffins are degraded relatively rapidly by microorganisms and the toxic light aromatic hydrocarbons are rapidly lost from an oil slick by dissolution and evaporation, any program concerning the potential long-term biological effects of an oil spill needs to consider the other components remaining in weathered petroleum. (See also W79-01788) (Sinha - OEIS)
W79-01799

POTENTIAL INTERACTION OF MICROORGANISMS AND POLLUTANTS FROM PETROLEUM DEVELOPMENT,
Louisville Univ., KY. Dept. of Biology.
R. M. Atlas.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 156-166, 2 fig, 1 tab, 8 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Microorganisms, *Alaska, Baseline studies, Weathering, Ice, *Outer Continental Shelf, Petroleum hydrocarbons, Light hydrocarbons.

As a result of data gathered ancillary to reconnaissance and fate of oil studies, some limited results have been found on the effects of oil on microorganisms. It was found that hydrocarbons are degraded very slowly. Persistence from a moderate oil spill must be thought of in terms of years instead of days, or months. Under certain conditions, such as under ice the physical evaporative losses of light hydrocarbons, many of which are highly toxic, are greatly restricted. Similarly losses of light hydrocarbons in sediment appear to be restricted due to adsorption. Components, such as naphthalene, are found still present weeks after spillage under ice. The implication of this finding is that low molecular weight oil components will reside for prolonged periods under certain conditions in Alaska ecosystems. In contrast to sediment and under ice, volatile components are lost within days from open water spillages. The residual oil recovered from these studies had the same composition of the oil in terms of component classes as the freshly spilled oil. (See also W79-01788) (Sinha - OEIS)
W79-01800

MICROBIAL ACTIVITY AND CRUDE OIL-MICROBIAL INTERACTIONS IN WATER AND SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Microbiology; and Oregon State Univ., Corvallis. School of Oceanography.
R. Y. Morita, R. P. Griffiths, T. M. McNamara, and S. E. Steven.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development, 'September 1978. P 167-187, 11 fig, 3 tab, 3 ref.

Descriptors: *Water pollution effects, *Oil pollution, Microorganisms, *Biodegradation, Baseline studies, *Alaska, Sediments, Food webs, Bacteria, Nitrogen fixation, *Outer Continental Shelf, Crude oil, Cook Inlet.

Research efforts deal mainly with direct counts of the microbial population (epifluorescent counts), heterotrophic activity at in situ temperature, and laboratory studies dealing with microbial functions at low temperature in relation to petroleum degradation (crude oil used from the specific locality), nitrogen fixation, chitinase activity, etc. in the presence and absence of crude oil. The relative microbial activity as determined by the heterotrophic potential method for the Lower Cook Inlet during April and October cruises are presented. The highest level of activities were seen in the northern-most stations using either glucose or glutamic acid as substrates. Lower values offshore were observed to the southwest of Kamishak Bay, in the center of the inlet. Values found in Kachemak Bay were still lower, and those values seen in the south and southeastern sections were the lowest. This is very similar to the pattern of relative microbial uptake that was seen in water samples analyzed during the fall 1976 cruise in the same area. (See also W79-01788) (Sinha-OEIS)
W79-01801

INFLUENCE OF PETROLEUM ON EGG FORMATION AND EMBRYONIC DEVELOPMENT IN SEABIRDS,
California Univ. at Davis, Stinson Beach. Point Reyes Bird Observatory.
D. G. Ainley, and C. R. Grau.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 188-198, 4 tab, 8 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Birds, *Reproduction, Baseline studies, California, Alaska, *Outer Continental Shelf, Seabirds, Crude oil, Bunker C oil, Prudhoe Bay, Ptychoramphus aleutica, Larus occidentalis.

This study appraises the effects that a brief exposure to an oil spill would have on the reproduction of Cassin's Auklets (Ptychoramphus aleutica) and on Western Gulls (Larus occidentalis) nesting on the Farallon Islands of California. These species are representative of many birds breeding along the Pacific Coast that are at risk from oil pollution during the reproductive period. Females of breeding pairs of auklets were dosed with bunker C oil or empty capsules as controls, and egg production, hatching success, and fledging success were determined. Samples of eggs were compared in regard to yolk structure, presence of oil components, and embryonic development. Attempts to dose gulls were unsuccessful. (See also W79-01788) (Sinha OEIS)
W79-01802

EFFECTS OF PETROLEUM EXPOSURE ON THE BREEDING ECOLOGY OF THE GULF OF ALASKA HERRING GULL GROUP (LARUS ARGENTATUS X LARUS GLAUCESCENS)M,
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 199-215, 10 fig, 5 tab, 13 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Birds, *Breeding, Ecology, Alaska, Baseline studies, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, North Slope, Gulf of Alaska, Herring gulls, Larus argentatus, Larus glaucescens.

An analysis is given of the effects of petroleum exposure on the breeding ecology, including incubation behavior and hatching success, of the Gulf of Alaska Herring Gull group (Larus argentatus Larus glaucescens). Conclusions from the experiments are: very small amounts of North Slope Crude Oil exposure to gull eggs in the field, early stages of incubation, lead to high embryonic mortality. Embryonic resistance to petroleum exposure increases with the duration of incubation. Mineral oil in equivalent microliter doses causes no significant mortality. (See also W79-01788) (Sinha OEIS)
W79-01803

EFFECTS OF OILING ON TEMPERATURE REGULATION IN SEA OTTERS,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
G. Kooyman, and D. Costa.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 210-221, 2 fig, 3 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Water temperature, Animal metabolism, Mammals, Otters, Baseline studies, Respiration, *Outer Continental Shelf, Crude oil, Enhydra lubris.

Two otters are presently being studied at the Physiological Research Laboratory, Scripps Institution of Oceanography. After conditioning the otters accepted confinement in the metabolic test chamber, and their normal metabolic rates were measured at a variety of water temperatures. To date six hour metabolic runs at six different water temperatures between 5 and 30C have been made. The thermal neutral zone for otters has been preliminarily established and appears to have a lower critical temperature between 5 and 10C. Prudhoe crude oil has been applied to one otter on two different occasions and changes in metabolic rate after oiling and washing have been made. The application of 38 mls and 60 mls of crude oil upon the dorsal surface of the sea otter increased the otter's average metabolic rate 24% and 60% respectively. However, two weeks after the oiling experiment, routine blood samples were taken from both otters for routine examination and the otter which had been oiled exhibited an unusually high white blood cell count. The otter was then transferred to Sea World for veterinary care and is currently still at Sea World suffering from what is believed to be a deep seated pneumonia. The pneumonia is probably a result of the stress encountered by the otter during the post-washing period. (See also W79-01788) (Sinha-OEIS)
W79-01804

AN OVERVIEW OF NOAA'S ENERGY RESOURCES PROJECT ON FATE AND EFFECTS OF CONTAMINANTS IN MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanic and Atmospheric Administr

on, Boulder, CO. Environmental Research Lab.
. A. Wolfe.
: NOAA Technical Memorandum ERL-CSEAP-1, 'Marine Biological Effects of OCS etroleum Development,' September 1978. P 223-25, 5 ref.

escriptors: *Water pollution effects, *Oil pollu-on, *Environmental effects, Marine biology, Eco-stems, Baseline studies, *Outer Continental helf, Petroleum development.

he general objectives of the National Oceanic d Atmospheric Administration's (NOAA) ergy resources project on fate and effects are to entify and conduct laboratory and field research udies that will facilitate the assessment of poten-l environmental impacts from petroleum releases coastal marine ecosystems. This effort does not ve a site-specific orientation; instead, it is fo-sed on the fundamental processes that control e distribution, transport, and effects (including ysiological and ecological aspects) of petroleum mponents, toxic metals, and other contaminants coastal ecosystems. It is expected that the results the process-oriented studies conducted under is project will have broad applicability to envi-nmental problems in widely separated geograph-areas. (See also W79-01788) (Sinha-OEIS)
79-01805

HE NOAA NATIONAL ANALYTICAL FA-LITY -- A STATUS REPORT,
ational Oceanic and Atmospheric Administra-n, Boulder, CO. Environmental Conservation v.
D. MacLeod, Jr., D. W. Brown, and L. C. omas.
NOAA Technical Memorandum ERL-CSEAP-1, 'Marine Biological Effects of OCS troleum Development,' September 1978. p 226-7, 3 fig, 2 tab, 6 ref.

escriptors: *Water pollution, *Environmental ef-ts, *Facilities, *Research facilities, Baseline dies, Resources development, *Outer Continen-Shelf, Research priorities.

e NOAA National Analytical Facility was es-lished at the Northwest and Alaska Fisheries nter to provide NOAA's environmental pro-ams with detailed information on the types and ounts of trace chemical contaminants in the rine environment. The Facility is associated h an experienced multidisciplinary team of emists, biochemists, biophysicists, and physiolo-ts engaged in studies on contaminant-induced anges in marine biota. Interaction with this team scientists is important in relating the analytical rk of the Facility to environmental issues and cing interpretations of the data in an environ-ntal perspective. As part of its on-going re-rch, the Facility is investigating applications of h pressure liquid chromatography and ultravio-fluorescence spectrometry for the analysis of oil d its toxic constituents. These techniques should developed into new standard methods which uld then be compared with the existing ones. is applies especially to the analysis of the aroma-constituents of petroleum and their transforma-n products. (See also W79-01788) (Sinha-OEIS)
79-01806

SSIBLE TRACE METAL MOBILIZATION SELECTED TRACE ELEMENTS FROM L-IMPACTED SEDIMENTS,
lorado Univ., Boulder. Dept. of Chemistry.
. Miller, R. E. Sievers, G. Lange, J. Stanley, R. R. Meglen.
NOAA Technical Memorandum ERL-SEAP-1, 'Marine Biological Effects of OCS roleum Development,' September 1978. p 238-, 1 fig, 4 tab.

scriptors: *Oil pollution, *Water pollution ef-ts, *Sediments, *Trace elements, *Heavy als, Testing procedures, Baseline studies, Mer-y, Arsenic, Chromium, Nickel, *Outer Conti-tal Shelf, Petroleum hydrocarbons, Crude oil.

Research efforts at the University of Colorado were undertaken to experimentally test whether selected trace metals can be mobilized or released from oil-impacted sediments in natural seawater. Release of trace elements from either the bottom or, less importantly, from the crude oil (the potential for trace element release from oil itself is somewhat less than the potential release from the bottom sink due to interaction with constituents of petroleum) could alter the trace element concentrations potentially available to the ocean flora and fauna. Four target elements--mercury, arsenic, chromium, nickel--were studied. Under the experimental conditions used, results do not indicate any mobilization for three of the selected target metals occurring as the result of the interaction of oil upon sediments. Work is currently in progress for the remaining target element. (See also W79-01788) (Sinha-OEIS)
W79-01807

THE EFFECTS OF PETROLEUM HYDROCARBONS ON CHEMORECEPTION IN DUNGENESS CRAB CANCER MAGISTER.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
B. L. Olla.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 244-249, 12 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Animal behavior, Baseline studies, Crabs, *Outer Continental Shelf, *Petroleum hydrocarbons, Chemoreception, Cancer magister, Feeding behavior.

Food detection and gathering, predator recognition and escape, establishment and maintenance of commensal, symbiotic and parasitic relationships, and courtship and mating are all behaviors heavily relying upon chemoreception. The effect of petroleum upon those behaviors was investigated mediated by chemoreception in the Dungeness crab, Cancer magister. It was found that antennular flicking rate changes indicate that blue crabs can detect the hydrocarbons, naphthalene and methylnaphthalene, in seawater solution. The detection threshold for naphthalene is higher than for the DECE, and the threshold for methylnaphthalene is considered higher than that for naphthalene. Such results indicate tha antennular behavior in the blue crab may be a general response to any chemical change of the crab's environment. The usefulness of behavioral assays based upon antennular motion for other crabs and a variety of chemicals, natural and artificial, seems quite promising. (See also W79-01788) (Sinha-OEIS)
W79-01808

INTERACTIVE EFFECTS OF RESIDUES OF HYDROCARBONS, CHLORINATED HYDROCARBONS, AND HEAVY METALS ON THE METABOLISM AND BIOACCUMULATION OF PETROLEUM HYDROCARBONS IN MARINE FISH,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
E. H. Gruger, Jr., J. W. Hawkes, and D. C. Malins.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 250-269, 2 fig, 37 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Chlorinated hydrocarbon pesticides, *Metabolism, Heavy metals, Fish, Salmonids, Baseline studies, *Outer Continental Shelf, *Hydrocarbons, Petroleum hydrocarbons, Chlorobiphenyls, Bioaccumulation, Oncorhyncus, Salmo.

Research has uncovered some important factors that deal with interactive biochemical and morphological effects of contaminants in organisms in the marine environment. Species difference, wide variations among individual fish to respond biochemically to contaminants, and the potential for simultaneous interactions of chemicals from more than one class are factors which must be seriously considered in attempting to resolve environmental problems. The research specifically leads to the conclusion that chlorobiphenyls may either enhance or retard the normal biotransformations of petroleum aromatic hydrocarbons in exposed fish, in terms of responses of the hepatic microsomal AHH systems in chinook and coho salmon. Moreover, morphological changes occur in salmon as a result of food-path exposures of chlorobiphenyls and hydrocarbons; the changes appear less severe when the chemical classes are administered separately to the fish. Importantly, synergistic action by the two types of chemicals were apparent in morphological changes and increases in liver AHH activities for exposed salmon. The finding varied AHH activities relative to different substrates has important implications about the metabolism of petroleum hydrocarbons. (See also W79-01788) (Sinha-OEIS)
W79-01809

DESIGN OF FIELD EXPERIMENTS TO DETERMINE THE ECOLOGICAL EFFECTS OF PETROLEUM IN INTERTIDAL ECOSYSTEMS,
Resource Management Associates, Lafayette, CA.
S. F. Moore, and D. B. McLaughlin.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 270-290, 5 fig, 2 tab, 6 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Intertidal areas, *Ecosystems, *Baseline studies, Environmental effects, Resources development, Testing procedures, Ecology, *Outer Continental Shelf, Petroleum hydrocarbons, Field experiments.

A primary goal of field experiments is to learn more about causal relationships between controlled perturbations (treatments) and field observations. Specifically the goal is to design experiments which address the following objective: To study in the upper rocky intertidal community the effects on species abundance and distribution of various amounts and compositions of petroleum substances which may disturb the natural system in the following ways: physical/chemical disturbance, direct competition for space, disruption of competition and predation, and interaction with natural physical disturbances such as wave exposure and dessication. This paper highlights and summarizes the results of the study which resulted in a set of ecological and statistical design criteria to guide the translation of this overall objective into specific experimental designs. (See also W79-01788) (Sinha-OEIS)
W79-01810

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
Final Reports of Principal Investigators, Vol 1, June 1978. 490 p.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Resources development, Alaska, Plankton, Fishes, Biota, Invertebrates, Birds, Bibliographies, *Outer Continental Shelf, *Petroleum hydrocarbons, Lethal effects, Sublethal effects.

Seven final reports on baseline studies of the aquatic fauna and ecology of the Alaskan Continental Shelf which assess the environmental effects of petroleum developments in that area are compiled in this volume. Titles are: Lethal and Sublethal Effects on Selected Alaskan Marine Species after Acute and Long-term Exposure to Oil and Oil Components; Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea; A Review of the Leterature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska; Determination and Description of Kknowledge of the Distribution, Abundance, and Timing of Sal-

monids in the Gulf of Alaska and Bering Sea; Ichtyoplankton of the Eastern Bering Sea; Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronektona; and Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chuckchi Sea, and Kotzebue Sound. (See W79-01812 thru W79-01817) (NOAA)
W79-01811

LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. D. Rice, S. Korn, and J. F. Karinen.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol. 1, Biological Studies, June 1978. P 1-32, 2 tab, 25 ref. R7120822.

Descriptors: *Oil pollution, *Water pollution effects, *Toxicity, Alaska, Biota, Environmental effects, Baseline studies, *Outer Continental Shelf, Bering Sea, Beaufort Sea, Sublethal effects.

The research involves physiological and bioassay testss of applied research on species indigenous to the Gulf of Alaska, Bering Sea, and Beaufort Sea. The major emphasis has shifted from strictly descriptive acute toxicity determinations to mechanistic studies and sublethal tests that will eventually allow prediction of oil impacts on the biota. The studies have two basic themes. Toxicity challenge experiments, where sensitive species, live stages, factors that affect toxicity, or components that are most responsible for toxicity are identified; and sublethal physiological response, where physiological responses that are indicative of oil stress are identified, measured, and characterized. (See also W79-01811) (Sinha - OEIS)
W79-01812

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, A. C. Paulson, and J. R. Rose.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 1, Biological Studies, June 1978. P 33-107, 2 fig, 28 tab, 48 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Food habits, Marine fish, Oil pollution, Resources development, Benthos, *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Demersal fish.

The rationale behind this study was to develop an ability to predict the impact of oil developmet activities on the fishes in these two areas. The study, coupled with others designed to study acute and chronic toxic effects on the fish populations, will help establish the predictive base necessary to make management decisions. The research findings on polock, rex sole, rock sole, dover sole, flathead sole, arrowthooth flounder, Greenland halibut, capelin and shortfin eelpout are discussed. Existing information on Pacific cod, yellowfin sole and Pacific halibut is summarized. (See also W79-01811) (Sinha - OEIS)
W79-01813

A REVIEW OF THE LITERATURE AND A SELECTED BIBLIOGRAPHY OF PUBLISHED AND UNPUBLISHED LITERATURE ON MARINE BIRDS OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
J. C. Bartonek, and C. J. Lensink.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program Final Reports of Principal Investigators Vol 1 Biological Studies, June 1978. P 108-204, 1 fig, 1 tab. o1-06-022-11437.

Descriptors: *Birds, *Bibliographies, *Water pollution effects, Environmental effects, Baseline studies, Alaska, Oil pollution, *Outer Continental Shelf, *Petroleum development, Literature reviews, Bering Sea, Gulf of Alaska.

A bibliography of more than 900 references published before and during 1976 on birds of the coastal and marine environment with emphasis being on those birds from Alaska and adjacent areas is contained in this report. A cursory review of some of that information was made. The purpose of this report is to facilitate the identification of literature that is of regional ana topical importance in describing coastal and marine avifaunas and in assessing impacts upon those avifaunas from whatever causes. (See also W79-01811) (Sinha - OEIS)
W79-01814

DETERMINATION AND DESCRIPTION OF KNOWLEDGE OF THE DISTRIBUTION, ABUNDANCE, AND TIMING OF SALMONIDS IN THE GULF OF ALASKA AND BERING SEA. A SUPPLEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
D. E. Rogers.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 1, Biological Studies, June 1978. P 205-235, 9 fig, 11 tab, 3 ref.

Descriptors: *Salmon, *Water pollution effects, Baseline studies, Environmental effects, Alaska, Oil pollution, Outer Continental Shelf, Petroleum development, Gulf of Alaska, Bering Sea, Bristol Bay.

The annual variation in abundance and seasonal timing of the migrations of adult and juvenile (smolt) salmon since 1951 in the nearshore waters of Bristol Bay is described. The number of juvenile or adult salmon that migrate through Bristol Bay in an average year is best measured by the median number because the annual numbers are not normally distributed. The medians and ranges in the annual numbers of salmon are given in tabular form. In most years there is either a large abundance of smolts or a large abundance of adults. Years in which there are very large numbers of sockeye salmon occur at 4- or 5-year intervals. Juvenile pink salmon are usually present only in odd-numbered years and adult pink salmon are usually present only in even-numbered years. The Naknek-Kvichak District produced 36% of the smolts and 54% of the adult salmon in Bristol Bay in an average year; whereas, the Nushagak District produced 50% of the smolts but only 25% of the adults in Bristol Bay in an average year. Salmon are present in Bristol Bay from May through September; however, they are most abundant in June and July when there are usually millions of adults and hundreds of millions of smolts that are passing each other in their migrations to and from Bristol Bay. (See also W79-01811) (Sinha - OEIS)
W79-01815

ENVIRONMENTAL ASSESSMENT OF THE SOUTHEASTERN BERING SEA: ZOOPLANKTON AND MICRONEKTON,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Report of Principal Investigators, Vol 1, Biological Studies, June 1978. p 238-337, 33 fig, 6 tab, 12 ref, 3 append. 03-5-022-56.

Descriptors: *Plankton, *Zooplankton, *Environmental effects, *Oil pollution, *Biota, *Water pollution effects, Baseline studies, Alaska, Resources development, Sea ice, *Outer Continental Shelf, *Micronekton, Ice pack, Petroleum development, Bering Sea, Environmental impact, Calamus plumchrus.

Outer Bristol Bay and the St. George Basin area were both considered potential sites for offshore petroleum development and as such warrented careful examinations of community composition and descriptions of seasonality. Since most species found in these waters (excluding sea birds and marine mammals) pass through and early plan
tonic life history stage, an understanding of t
ecology of this complex assemblage was thoug
to be of great importance in assessing the possit
effect of offshore industrial development. Th
study reveals that there is nothing particular
unusual about the animal plankton and microne
ton communities in the southeastern Bering Se
What is not clearly known, is how these popu
tions exploit their environment in this region a
are in turn utilized by other members of the co
munity. Although nearly 200 species can be four
only 20 or 30 are trophically important at t
lowest consumer levels in maintaining the lar
populations which feed upon them. From an ec
logical vantage point, this result indicates that m
of the organic carbon utilized by pelagic graze
passess through relatively few but abundant subp
pulations which sustain the rest of the syste
While this may be biologically efficient, it cou
become critical if these sustaining populations we
adversely affected in any long term way. Howe
er, since the coastal shelf areas tend to be inf
enced by relatively steady current flow, any loc
ized effects would soon be absorbed by mixing a
advection. (See also W79-01811) (Sinha - OEI
W79-01816

**TRAWL SURVEY OF THE EPIFAUNAL I
VERTEBRATES OF NORTON SOUN
SOUTHEASTERN CHUKCHI SEA, AND KO
ZEBUE SOUND,**
Alaska Univ., College. Inst. of Marine Scien
H. M. Feder, and S. C. Jewett.
In: NOAA/ERL Outer Continental Shelf En
ronmental Assessment Program, Final Reports
Principal Investigators, Vol. 1, Biological Studi
June 1978. p 338-486, 26 fig, 16 tab, 12 append.
5-022-56.

Descriptors: *Ecosystems, *Water pollution
fects, *Invertebrates, Baseline studies, Alaska,
and gas, Oil pollution, Resources developme
*Outer Continental Shelf, Petroleum developme
Environmental impact, Norton Sound, Chuk
Sea, Kotzebue Sound, Epifauna.

It was the primary intent of this investigation
collect information on the composition, distri
tion, and biology of the epifaunal invertebr
components of Norton Sound, southeastern Ch
chi Sea, and Kotzebue Sound. The trawl surv
for the investigation of epifaunal invertebrates
effective, and excellent spatial coverage of
shelf of the northeastern Bering Sea and southe
ern Chukchi Sea was obtained. Taxonomic analy
of the invertebrates collected in the Norton Sou
area delineated 13 phyla and 187 species; Chuk
Sea - Kotzebue Sound invertebrates consisted o
phyla and 171 species. Echinoderms made up
bulk of the invertebrate biomass with 80.3% in
Norton Sound region and 59.9% in the Chuk
Sea - Kotzebue Sound region. Other import
phyla were Arthropoda and Mollusca. The imp
tance of deposit-feeding clams in the diet of sta
flounders and sea stars is demonstrated. A h
probability exists that oil hydrocarbons will e
starry flounders, sea stars and other bivalve pr
ators via deposit-feeding molluscs, suggesting
studies interrelating sediment, oil, deposit-feed
clams, and appropriate predator species should
initiated soon. (See also W79-01811) (Sinh
OEIS)
W79-01817

**ENVIRONMENTAL ASSESSMENT OF T
ALASKAN CONTINENTAL SHELF FINAL
PORTS OF PRINCIPAL INVESTIGATO
VOL 2. BIOLOGICAL STUDIES.**
National Oceanic and Atmospheric Adminis
tion, Boulder, CO. Outer Continenta Shelf E
ronmental Assessment Program.
Final Reports of Principal Investigators, Vo
June 1978. 959 p.

Descriptors: *Baseline studies, *Resources de
opment, *Oil pollution, *Water pollution effe
*Alaska, Environmental effects, Shellfish, F
*Outer Continental Shelf, *Gulf of Alaska, Dem
sal fish, Petroleum development.

final report in three parts on baseline studies of aquatic fauna and ecology of the Alaskan Continental Shelf which assesses the environmental ects of the petroleum developments in that area ncluded in this volume. Title of the report is: mersal Fish and Shellfish Resources of the Gulf Alaska from Cape Spencer to Unimak Pass, 8 - 1976: A Historical Review. (See W79-01819 u W79-01821) (NOAA)
79-01818

MERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM PE SPENCER TO UNIMAK PASS 1948 - 6. A HISTORICAL REVIEW. VOLUME 1,
ional Marine Fisheries Service, Seattle, WA. rthwest and Alaska Fisheries Center.
L. Ronholt, H. H. Shippen, and E. S. Brown.
NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of ncipal Investigators, Vol. 2, Biological Studies, e 1978. p 1-304.

scriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, neries, Water quality, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Resource availability, vironmental assessment, Demersal fisheries, Peeum development.

study area includes the continental shelf and er slope in the northern Gulf of Alaska from e Spencer to Unimak Pass. The first volume of r report contains: (1) a description of the study including its physical features and fauna; (2) a ng of the data sources utilized; (3) a general ew of the history of exploitation of demersal hes and shellfishes by domestic and foreign ducers; (4) a review by regions within the study of fish catches by the Unites States and Japan n 1969 through 1974/1975, and a review of the t United States-Canada halibut catch from 0-1968 and from 1969-1975; (5) a listing and ting of specific locations of high productivity U.S. Fisheries from 1960-1975, and for Japa- bottomfish catches from 1964-1974; and (6) a ription of and results obtained from exploratoshing cruises for demersal fishes and shellfishes in the study area from 1948 through 1970. (See W79-01818) (Sinha - OEIS)
-01819

MERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM PE SPENCER TO UNIMAK PASS 1948 - . A HISTORICAL REVIEW. VOLUME 2,
onal Marine Fisheries Service, Seattle, WA. thwest and Alaska Fisheries Center.
. Ronholt, H. H. Shippen, and E. S. Brown.
NOAA/ERL Outer Continenta Shelf Environtal Assessment Program, Final Reports of cipal Investigators, Vol 2, Biological Studies, 1978. p 305-623.

criptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, eries, Water quality, Alaska, *Outer Continenhelf, *Gulf of Alaska, *Resource availability, ronmental assessment, Demersal fisheries, Peum development.

me 2 of the report on the area which includes ontinental shelf and upper slope in the northGulf of Alaska from Cape Spencer to Unimak includes the following: (1) descriptions of and ts of demersal resource assessment surveys for alid shrimps during the period of 1971-1976; (2) description of an results of demersal re- assessment surveys in 1961-1962 and 1973- (See also W79-01818) (Sinha-OEIS)
-01820

ERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM E SPENCER TO UNIMAK PASS 1948 - A HISTORICAL REVIEW. VOLUME 3,
nal Marine Fisheries Service, Seattle, WA. nwest and Alaska Fisheries Center.
Ronholt, H. H. Shippen, and E. S. Brown.
NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 2, Biological Studies, June 1978. p 624-955.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, Fisheries, Water quality, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Resource availability, Environmental assessment, Demersal fisheries, Petroleum development.

Volume 3 of the report on the area which includes the continental shelf and upper slope in the northern Gulf of Alaska from Cape Spencer to Unimak Pass continues the description of an results of demersal resource assessment surveys in 1961-1962 and 1973-1976 and a comparison of the demersal resource assessment survey results obtained in 1961-1962 with those obtained in 1973-1976. (See also W79-01818) (Sinha-OEIS)
W79-01821

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Final Reports of Principal Inves

Descriptors: *Water pollution effects, *Baseline studies, Resources development, Eators, Vol 3, Biological Studies, June 1978.

Three final reports on baseline studies of the aquatic fauna and ecology of the Alaskan Continenta Shelf which assess the environmental effects of petroleum developments in that area are compiled in this volume. Titles are: Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska; Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet; and Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska. (See also W79-01823 thur W79-01825) (NOAA)
W79-01822

COMMUNITY STRUCTURE, DISTRIBUTION, AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis.
J. A. Wiens, D. Heinemann, and W. Hoffman.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. P 1-175, 58 fig, 24 tab, 55 ref.

Descriptors: *Baseline studies, *Water pollution effects, *Environmental effects, *Birds, Aquatic birds, Ecosystems, Alaska, Resources development, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Environmental assessment, Feeding flocks, Aves.

A standardized method for transect censusing of marine birds from shipboard at sea is described. All birds seen in an arc of 90 degrees, from the bow to one beam, are recorded over 15-30 min transect runs. For each sighting, the number of birds, species, distance, the angle from the transect line to the birds, and the direction of flight of flying birds are recorded. The various methods of transect-based density estimation are considered, the major findings of studies of marine bird distribution and abundance in the Gulf of Alaska are detailed, and the patterns of organization typifying mixed species feeding flocks in this region are described. Views regarding the influences of petroleum development on the populations and population attributes are evaluated. (See also W79-01822) (Sinha-OEIS)
W79-01823

RECONNAISSANCE OF THE INTERTIDAL AND SHALLOW SUBTIDAL BIOTIC LOWER COOK INLET,
Dames and Moore, Homer, AK.
D. C. Lees.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. p 179-506, 24 fig, 35 tab, 15 ref.

Descriptors: *Baseline studies, *Surveys, *Intertidal areas, Water resources, Benthos, Biota, Alaska, Geological surveys, *Outer Continental Shelf, Cook Inlet, Resources management, Airborne surveys, Subtidal areas, Petroleum development.

A reconnaissance survey of the intertidal and shallow habitats of lower Cook Inlet was conducted during May, June, July and August 1976. This survey comprised an aerial reconnaissance of the west side of the inlet and examination of several sites in representative habitats in the intertidal and shallow subtidal zones on both sides of the inlet. Species compositions and complexity of the biotas vary distinctly by substrate. The intertidal faunal assemblages were basically dominated by the same species, but their diversity, robustness and maturity differed dramatically. If the benthic assemblages of Cook Inlet are divided into export systems (producing more plant material (energy) than required to maintain their faunal assemblages) and inport systems (producing less plant material than necessary to support their faunal assemblages and therefore importing plant material), an interesting and important pattern is observed. The water circulation regime is certainly sufficiently dynamic to facilitate the transport of plant materials to import systems. The apparent patterns in the distribution of import and export assemblages are important in understanding the inter-relationships of the Cook Inlet system and should provide some very useful tools in planning resource management and petroleum development in lower Cook Inlet. (See also W79-01822) (Sinha-OEIS)
W79-01824

AIRBORNE MULTISPECTRAL MAPPING OF THE INTERTIDAL ZONE OF SOUTHERN ALASKA,
Environmental Research Inst of Michigan, Ann Arbor. Infrared and Optics Div.
N. E. G. Roller, and F. C. Polcyn.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. p 507-619, 30 fig, 9 tab, 7 ref. 03-7-022-35208.

Descriptors: *Mapping, *Intertidal areas, Water resources, *Surveys, *Baseline studies, Alaska, Vegetation, Algae, *Outer Continental Shelf, *Airborne surveys, Petroleum development.

Multispectral analysis was performend on a data set collected by low flying aircraft at three sites in the Gulf of Alaska, i.e., Zaikof Bay, Latouche Point and Cape Yakatadga for the purpose of mapping intertidal algal communities. Both supervised and unsupervised processing procedures were employed. It is possible to separate vegetation into broad spatial zones representing either species of algae of species associations or simply vegetation density classes. Clustering techniques represent the most effective way to extract training signatures. A minimum of four spectral bands is needed to achieve the recognition performance levels demonstrated in the study. Two channels in the visible (green and red), one in the near-infrared region and one in the thermal region were found most useful. A hypothetical intertidal survey of 1200 miles of Alaska shoreline is outlined with summaries of data collection and processing costs given for the mission using optimum spectral bands. (See also W79-01822) (Sinha - OEIS)
W79-01825

EFFECTS OF THERMAL DISCHARGE UPON A SUBARCTIC STREAM,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-01898

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATIONAL AREA,

Alaska Univ., Fairbanks. Inst. of Water Resources.
J. D. LaPerriere.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 385, Price codes: A03 in paper copy, A01 in microfiche. Report IWR-90, June 1978. 21 p, 6 fig, 2 tab, append. OWRT B-026-ALAS(2), 14-31-0001-4056.

Descriptors: Lakes, *Productivity, *Morphology, *Plant growth, *Nutrients, *Algae, Fisheries, *Alaska, *Recreation, Regression analysis, Tropic levels, *Morphoedaphic indices(Lakes), Tanana Lakes(Alas).

Results of work on two different lake areas, each a recreational focus for a large city in Alaska are presented. The productivity of these lakes has been classified according to their morphoedaphic index (MEI). This is the ratio between an edaphic (effects due to soil) factor usually measured as total dissolved solids (total residues), and a morphometric parameter, namely mean depth. Shindler's model for a particular morphoedaphic index, which is the ratio of the area of the lake and its watershed to the lake volume, was applied to data taken at the Tanana Lakes near Fairbanks. The regressions of various algal growth parameters with Schindler's index gave insignificant r's. This is likely due to the small variation in these parameters between the lakes. It is also likely due to the fact that any morphoedaphic index is most likely to regress strongly with measurements of the total production of a trophic level from lake to lake, and algal production is only a fraction of total primary production in these lakes.
W79-01900

ECOLOGY AND PATHOLOGY OF WILDLIFE IN RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT - PHASE I,

Pennsylvania State Univ., University Park. Coll. of Agriculture.
R. G. Anthony, F. B. Samson, P. J. Glantz, D. C. Kradel, and H. Rothenbacher.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 366, Price codes: A09 in paper copy, A01 in microfiche. Inst. for Research on Land and Water Resources, University Park, PA Research Project Technical Completion Rpt. August 1978. 189 p, 15 fig, 58 tab, 11 ref. OWRT B-084-PA(2), 14-34-0001-6113.

Descriptors: Habitats, *Pennsylvania, *Mosquitoes, *Heavy metals, *Wastewater irrigation, E. coli, *Chlorinated sewage effluents, *Wildlife, Ecology, *Arthropods, *Habitat alteration, *White-footed mice, *Forest habitat, Condition indices, Blood profiles, Cottontail rabbit, Arbovirus activity, Coccidiosis, Helminth infections, Meadow vole, Passerine birds.

In Pennsylvania, forest habitats irrigated with wastewater showed an increase in the abundance of vegetation at the lower layer. Arthropod abundance in this layer also increased. The overall abundance of passerine birds increased in the irrigated aspen-pine-shrub type, but decreased in the mixed-oak. The accumulation of heavy metals in voles inhabiting the reed canarygrass field was not significant, and concentrations of lead and cadmium in mice inhabiting the wastewater-treated forest plots were not considered hazardous. The prevalence of antibody for arboviruses ranged from 0 to 3.5 percent in rabbits from areas which will be included in the expansion of the wastewater-irrigation system. Five of the arboviruses being transmitted are potential pathogens to humans and borne primarily by mosquitoes. Body measurements, samples of blood, and organ tissues from wild rabbits were collected from the 500-acre area scheduled for future irrigation and a reference area. The level of coccidiosis and the helminth infections of rabbits did not seem to be markedly influenced by age, sex, season, or area. A new species of coccidia was described. Weight/length ratios of body size and population estimates of white-footed mice and meadow voles were obtained during 1974 to 1977. (Sink-Penn St)
W79-01902

CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO BLUE-GREEN ALGAE AND OTHER NUISANCE ORGANISMS,

Missouri Univ.-Kansas City. Dept. of Biology.
M. S. Stern, D. H. Stern, and L. L. Ray

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 490, Price codes: A05 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, University of Missouri, Columbia Completion Report, November 30, 1978. 84 p, 13 fig, 23 tab, 56 ref. OWRT A-099-MO(2), 14-34-0001-7053, 7054 and 8027.

Descriptors: *Copper sulfate, *Citric acid, Algae, Algicides, Toxicity, Toxicity tests, *Cyanophyta, Microcystis, Aphanizomenon.

Copper toxicity tests were carried out using two species of blue-green algae, Aphanizomenon flos-aquae and Microcystis aeruginosa. Copper concentrations of 300 microgram/liter or higher inhibited the growth of Aphanizomenon. The addition of 600 microgram Cu++/liter was the minimum copper concentration necessary to inhibit Microcystis growth over a 14-day experimental period. Copper solubility and cupric ion toxicity were enhanced by the addition of citric acid. Citric acid had no adverse effects on the algicidal properties of copper sulfate. A ratio of citric acid at eight times the weight of copper sulfate pentahydrate at a copper concentration of 500 microgram/liter (8:1 citrate-copper sulfate mixture) was inhibitory to Microcystis growth over a 14-day period, whereas the addition of 500 microgram Cu++/liter alone was not. The 8:1 mixture had the same effects as the addition of 600 microgram Cu++/liter. The increased cupric ion toxicity was not due to a pH effect.
W79-01906

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,

Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., A. W. McIntosh, and J. M. DiLouie.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 489, Price codes: A03 in paper copy, A01 in microfiche. Partial Technical Completion Report, September 1978. 38 p, 9 fig, 3 tab, 8 ref, append. OWRT A-048-NJ(4), 14-34-0001-8032.

Descriptors: *Water pollution, *Environmental effects, Water quality, Erosion, Flood plain management, Bank erosion, Urban drainage, *New Jersey, *Harry's Brook(NJ), *Stream surveillance, *Biological health of streams.

Streams in urbanizing areas are subject to a variety of stresses produced by the processes of growth; most of the resulting changes are environmentally adverse. Unfortunately, small streams are so numerous and conditions in them may change so rapidly that conventional monitoring networks cannot deal with them. The condition of these streams may be more accurately monitored by biological evaluations than by measurements of the usual water quality parameters. A surveillance of Harry's Brook in Princeton Township, New Jersey, was conducted to evaluate the biological health of the stream, the pollution sources to which it is subject and certain other physical conditions relevant to management. The overall quality of the stream appeared good, although sampling of the benthic macroinvertebrate community in riffles indicated low numbers of both taxa and organisms, although the caddisfly larva Hydropsyche sp. and Cheumatopsyche sp. were found in large numbers in several riffles. Both bank and channel erosion were common, particularly along the main stem of Harry's Brook. As urbanization continues in upstream sections, erosion problems may be expected in these areas.
W79-01907

EFFECTS OF NUTRIENT ENRICHMENT OF A SALT MARSH ON DIATOM COMMUNITIES,

Mississippi State Univ., Mississippi State. Water Resources Research Inst.
M. J. Sullivan.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 388, Price codes: A03 in paper copy, A01 in microfiche. Report, 1978. 40 p, 1 fig, 10 tab, 17 ref, 6 pl. OWRT A-114-MISS(1). 14-34-0001-8026.

Descriptors: *Water pollution effects, *Diatoms, *Nitrogen, *Phosphorus, *Salt marshes, Nutrients, Soil algae, Eutrophication, Bioindicators, Biological communities, *Mississippi, Water quality, Community structure, *Graveline Bay Marsh(Miss), Spartina, Nitzschia, Navicula.

Edaphic diatoms were collected on a seasonal basis from a monotypic stand of Spartina alterniflora Loisel. on Graveline Bay Marsh, Mississippi; the marsh surface had been enriched with inorganic nitrogen (N) and/or phosphorus (P). During the winter collection, P and N-P enrichment significantly decreased species diversity (H') while N and P enrichment significantly decreased the number of taxa in a sample. Of the 87 taxa encountered, examination of the distributions of the more abundant ones revealed that nutrient enrichment neither introduced new taxa nor eliminated preexisting taxa. A 2-way ANOVA (treatment x date) of the relative abundances of the 12 most abundant taxa showed that only main effects were significant and only two taxa were significantly affected by the treatments. Nitzschia obsidialis Hust. responded favorably to P enrichment and N. obtusa W. Sm. to N enrichment. Structural similarity between selected pairs of edaphic diatom communities was quantified using a similarity index (SIMI) and values were exceedingly high. The aerial yield of S. alterniflora was unaffected by any of the treatments. In view of the few significant effects of nutrient enrichment found, it was concluded that the edaphic diatom community studied was not subject to N or P limitation.
W79-01982

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,

Oklahoma State Univ., Stillwater. School of Civil Engineering.
M. H. Bates, and N. J. Neafus.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 60. Price codes: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute Oklahoma State University Final Technical Completion Report, 1978. 34 p, 8 fig, 2 tab, 44 re. OWRT A-074-OKLA(1).

Descriptors: *Orthophosphates, *Lake sediment, *Oklahoma, Lakes, *Lake Carl Blackwell(Okla, *Phosphorus, Phosphates, Mixing, Microorganisms, Aerobic conditions, *Anaerobic condition, Nutrients, Water pollution effects.

A laboratory study was conducted to determine the effects of mixing, microorganisms and aerobic and anaerobic conditions on the release of soluble orth-phosphate from lake sediments obtained from Lake Carl Blackwell, Oklahoma. Release was enhanced by mixing, the presence of microorganisms and anerobic conditions. Phosphorus release under aerobic conditions did occur in the experimental systems. However, anaerobic release was greater. The concentration of phosphorus in the overlying water as the result of release from the sediment exceeded, in many cases, the values found in the literature for the limiting concentration of phosphorus for an aquatic system. Phosphorus released from the sediments in Lake Carl Blackwell could support substantial aquatic growth even in the absence of any external nutrient contribution.
W79-01984

CLAMATION OF POLLUTED FARM
NDS,
uisiana Tech Univ., Ruston. Coll. of Engineer-
.
r primary bibliographic entry see Field 5G.
9-01988

E EFFECTS OF ADVECTION-DIFFUSION
OCESSES ON THE EUTROPHICATION OF
RGE LAKES, A HYPOTHETICAL EXAM-
E: LAKE SUPERIOR,
nada Centre for Inland Waters, Burlington (On-
o).
Halfon, and D. C. L. Lam.
ological Modelling, Vol. 4, No. 2-3, p 119-131,
ruary, 1978. 6 fig, 2 tab, 8 ref.

scriptors: *Lake Superior, *Advection, *Diffu-
, *Eutrophication, *Phosphorus, *Water pollu-
effects, Great Lakes, Lakes, Nutrients, Spatial
ribution, Oligotrophy, Simulation analysis,
del studies, Mathematical models, Hydrodyna-
s, Primary productivity, Water circulation,
tification, Mixing, Upwelling, Water tempera-
, Solar radiation, Algae, Forecasting.

cts of a hypothetical tenfold increase of phos-
rus loading to oligotrophic Lake Superior are
delled, considering both dispersion mechanisms
biological processes which determine spatial
vements of the phosphorus. These movements
simulated using computed currents from a
e-dimensional hydrodynamic model. A biologi-
submodel describes phosphorus dynamics and
ary production in each grid cell of 20 x 20 km.
eased phosphorus loading is applied to two
tions in the lake: (1) a semi-closed bay at the
hwestern end of the lake, and (2) an open
e with strong local currents along the lake's
hwestern edge. The model conveys a number
nportant temporal and spatial scenarios, which
form some of the fundamental blocks for
sidering practical local and lakewide eutrophi-
on problems. Consistent with other studies, it is
cluded that a nutrient-impoverished system like
e Superior's with a low half-saturation constant
sub s) and limited storage capacity, is very
itive to pollution, and once perturbed, the re-
ery time is very lengthy. In Lake Superior K
s related to phosphorus uptake is very low
micrograms P/liter), rendering the model
itive to increased loading. The analysis includ-
ffects on primary production of water circula-
diffusion, thermal stratification, horizontal
vertical diffusion, mixing, upwelling and
nwelling, temperature, and sunlight. Weak-
es of the model are discussed. (Lynch-Wiscon-

-01993

TUDY OF PARAMETER ESTIMATION
OCEDURES OF A MODEL FOR LAKE
OSPHORUS DYNAMICS,
zmann Inst. of Science, Rehovoth (Israel).
. of Isotope Research.
ewis, and A. Nir.
ogical Modelling, Vol. 4, No. 2-3, p 99-117,
uary, 1978. 6 fig, 7 tab, 27 ref, 2 append.

riptors: *Phosphorus, *Computer models,
ameters, *Estimating, *Methodology, *Eutro-
ation, Ecosystems, Lakes, Model studies, Sim-
on analysis, Algorithms, Greifensee(Switz),
zerland), Monte Carlo method, Self-Consisten-
est, Nutrients.

ethod is presented for evaluating parameter
ation in lake ecosystem modelling, using for
ration data from Greifensee, Switzerland, and
duced version of a complex eutrophication
el of lake phosphorus dynamics. The method,
d the Self-Consistency Test, assigns a weight
rameter self-consistency using additional sim-
d data. Such characteristic features of many
ystem models as complexity, time-variability,
nearity, and sparsity of data demand a reliable
neter estimation startegy to reinforce confi-
e in model results. The reduced model is used
basis for a progressive investigation of the
tiveness of several possible criteria for param-
eter estimation; the last step uses Monte Carlo techniques to supplement the sparse data in order to evaluate the uniqueness and robustness of the estimates as a function of the number of data. Parameter estimation algorithms used at present for nonlinear, multidimensional models are unable to overcome the problem of multimodality of the objective function, and the choice of objective function and sparsity of data can contribute to ambiguous parameter estimates. Although one set of parameters is proposed here, the Self-Consistency Test has certain shortcomings and there are problems in generalizing to other systems: (1) the preferred parameter set may not objectively be the best set; (2) the self-consistency checks could turn into circular arguments, and (3) initial values of parameters can determine the results of the estimates. (Lynch-Wisconsin)
W79-01994

MEASUREMENTS OF PHYTOPLANKTON-PROTEIN CONTENT WITH THE HEATED BIURET-FOLIN ASSAY,
USV Pharmaceutical Corp., Tuckahoe, NY.
For primary bibliographic entry see Field 5A.
W79-01995

MARINE ALGAL VEGETATION IN SHALLOW WATER AROUND THE DANISH ISLAND OF SALTHOLM, THE SOUND,
Institut for Sporeplanter, Copenhagen(Denmark).
A. Kristiansen.
Botanisk Tidsskrift, Vol. 72, No. 4, p 203-226, 1978. 12 fig, 7 tab, 33 ref.

Descriptors: *Saltholm(Denmark), *Marine algae, *Floral lists, *Shallow water, *Littoral, Denmark, Baltic Sea, Islands, Algae, Salinity, Coasts, Brackish water, Cyanophyta, Rhodophyta, Phaeophyta, Chlorophyta, Seasonal, Classification, Epiphytes, Fucus vesciculosus.

Seventy-two species of marine algae were collected from shallow water (0-.75 m) within 300 m of the coastline of 7 x 2.5-km Saltholm Island, Denmark, in the Sound. During the survey (May-August 1976) seven sites were studied, and species belonging to Cyanophyceae, Rhodophyceae, Phaeophyceae, and Chlorophyceae were identified. An annotated list of the species, and tables relating species distribution to site, depth, and substrate are given. Surface water temperatures (five-day averages) ranged from 0.9-19.6C over 1976. Salinity fluctuates greatly each day, averaging 11-13%. Water level is very changeable. The supralittoral zone is only weakly developed on Saltholm, and most of the eulittoral zones were without vegetation down to a depth of about 15 cm. In the sublittoral, at a depth of 20-30 cm the dominant Fucus vesciculosus plats were typically covered with about 15 species of epiphytic alge, especially Elachist, Philayella, Ectocarpus, Spongonema, Dictyosiphon, Ceramium, and Polysiphonia. On the lower parts of Fucus (at a depth of 30-35 cm) few epiphytes were found, and the border of the sublittoral is therefor established at that depth. With increasing depth Fucus grows taller and broader, and epiphyte quantity increases, with an increasing abundance of red algae and occurrence of large individuals (10 cm or more). Saltholm's marine algal flora can be considered an outpost of the shallow water flora of the brackish Baltic Sea. Five species new to Denmark were recorded. (Lynch-Winsconsin)
W79-01996

NITROUS OXIDE IN THE OXYGEN MINIMUM OF THE EASTERN TROPICAL NORTH PACIFIC: EVIDENCE FOR ITS CONSUMPTION DURING DENITRIFICATION AND POSSIBLE MECHANISMS FOR ITS PRODUCTION,
Oregon State Univ., Corvallis. School of Oceanography.
Y. Cohen, and L. I. Gordon.
Deep-Sea Research, Vol. 25, No. 6, p 509-524, June, 1978. 8 fig, 2 tab, 58 ref. NR083102, N00014-76-C-0067.

Descriptors: *Nitrous oxide, *Nutrients, *Pacific Ocean, *Denitrification, *Sinks, *Ozone, Oxygen, Oceans, Tropical regions, Nitrogen, Nitrification, Oxygen depletion, Anaerobic conditions, Sea water, Eastern Tropical North Pacific Ocean, Fertilizers, Fossil fuels, Atmosphere, Nitrites, Saturation.

The eastern tropical North Pacific Ocean (ETNP) was found to be a net source for atmospheric nitrous oxide, though of small magnitude (0.14 pg N20/sq cm/sec), and nitrifications may be the most important mechanism for nitrous oxide production in the ETNP. Nitrous oxide plays a major role in controlling stratospheric ozone levels, and increasing use of fertilizers and combustion of fossil fuels is likely to promote ozone depletion. It is thus important to identify and evaluate all significant natural sources and sinks for atmospheric nitrous oxide. This study, which investigated nitrous oxide, oxygen, and nutrient distributions in the ETNP, showed biochemical nitrous oxide consumption around the core of oxygen minimum where denitrification takes place. Subsurface nitrous oxide minima were found at stations where intermediate waters contained near-zero oxygen levels and well-developed secondary nitrite maxima, characteristic of denitrification. Surface waters were saturated and average of 110% with nitrous oxide relative to a marine air content of 287 ppbv. Excpt for the oxygen-deficient layer where nitrous oxide minima were found, nitrous oxide was highly supersaturated at all stations from just below the mixed layer to about 1000 m. Supersaturations varied from 224-600% in shallow waters above the base of the pycnocline, and from 120-250% in waters below 1000 m. Denitrification is not important in nitrous oxide production in seawater, unlike the situation in soils. (Lynch-Wisconsin)
W79-01997

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
L. K. Wang, D. Vielkind, and M. H. Wang.
Ecological Modelling, Vol. 5, No. 2, p 115-123, July, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: Freshwater, Streams, *Mathematical models, *Waste water disposal, *Self-purification, *Dissolved oxygen, Effluents, Biochemical oxygen demand, Water pollution effects, Water pollution control, Oxygen sag, Oxygen depletion, Anaerobic conditions, Computer programs, Model studies, Biological properties, Water quality standards, Equations, Organic matter.

Modsel are presented for biological reactions to anaerobic conditions sand for dissolved oxygen saturation concentration in freshwater, and a brief description is given of the environmetal engineering significance of stream self-puriication, present stream water quality standards on DO concentation, and the solubility of DO in water. The DO saturation concentration model is useful for determining DO deficits, critical DO concentration, and allowable DO. drop in a stream receiving wastewater. Equations for calculating the critical distance (X sub c), the time required to reach the critical distance (T sub c), and the critical DO dificit (D sub c) are given. Unstable organic matter in wastewater accelerates microbiological oxidation and thus rapidly reduces DO concentration. In this paper the effluent is assumed to have low nutrient content and to be nontoxic and biodegradable. Biochemical oxygen demand of the effluent is initially exerted at a rate higher than the atmospheric reaeration rate at the water surface. The DO level decreases, finally reaching the critical point X sub c at which the rte of oxygen utilized for waste decompostion equals the rate of atmospheric reaeration. Further downstream the reaeration rate is greater than the BOD exertion rate and DO begins to increase and eventually the normal cycle is re-established (self-purification). At DO 1.0 mg/1 conditions become anoxic/anaerobic, resulting in hydrogen sulfice and organic sulfide odors, coloration, and destruction of fish and other organisms. (Lynch-Wisconsin)

W79-01998

EUTROPHICATION OF WATER BODIES: INSIGHTS FOR AN AGE-OLD PROBLEM,
Texas Univ.-Dallas, Richardson.
G. F. Lee, W. Rast, and R. A. Jones.
Environmental Science and Technology, Vol. 12, No. 8, p 902-908, August, 1978. 6 fig, 1 tab, 6 ref.

Descriptors: *Eutrophication, *Vollenweider models, *Nutrients, *Phosphates, *Nutrient removal, *Water pollution control, Water pollution effects, Water quality control, Phosphorus, Depth, Hydraulic residence time, Lakes, Pollutants, Point pollution, Nonpoint pollution, Great Lakes, Water pollution sources, Organization for Economic Cooperation and Development, Water management(Applied), Waste water treatment.

This report surveys the current state of information on the relationship between phosphate inputs to a water body and eutrophication-related water quality problems. Research of the past 10-15 years has established phosphorus as a key element controlling planktonic algal growth in freshwater; in marine waters nitrogen is generally the controlling factor. While past eutrophication control measures have been directed primarily toward control of phosphorus from point sources (especially domestic wastewater), it is now clear that for many water bodies phosphorus from nonpoint sources must also be controlled if acceptable water quality is to be restored. This paper includes: (1) a discussion of eutrophication processes; (2) definitions relating to lakes and lake enrichment; (3) description of the Vollenweider model for determining critical phosphorus laods to lakes (which relates areal phorphorus loading to the ratio of mean depth:hydraulic residence time; (4) identification of phosphorus sources; (5) overview of the OECD Eutrophication Study; (6) limnological measurement methods; and (7) effects of phosphours remova. Phosphorus can be reduced to a concentration of about 1 mg P/l in domestic wastewater effluent at a cost of less than $.01/person/day. Reduction of phosphorus loading can significantly decrease oxygen depletion rate and algal biomass and increase water clarity. It is well-established that for many water bodies internal phosphorus loading is small, and most bioavailable phosphorus is due to external sources. (Lynch-Wisconsin)
W79-02000

5D. Waste Treatment Processes

PREDICTING THE ANAEROBIC DEGRADATION OF ORGANIC CHEMICAL POLLUTANTS IN WASTE WATER TREATMENT PLANTS FROM THEIR ELECTROCHEMICAL REDUCTION BEHAVIOR,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-01539

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
D. Peterson.
Available from University Microfilms International, Ann Arbor, MI 48106. Ph.D. thesis, 1977. 240 p, 12 fig, 44 tab, 116 ref, 2 append. OWRT B-087-WIS(4), 14-31-0001-4139.

Descriptors: *Cost sharing, Cost analysis, *Sewage treatment, *Waste water treatment, Management, Wisconsin, Cost-benefit analysis, *Madison Metropolitan Sewerage District(Wisc).

The Madison Metropolitan Sewerage District and the Madison, Wisconsin urbanized area were chosen for a data base to demonstrate the pricing model. The objective of the pricing model is to maximize the aggregate consumer surplus of all households which use public wastewater services subject to the constraint that the MMSD breaks even; i.e. does not incur a loss. The residential users of the district were divided into three distinct population density groups to reflect the fact that population density is a key factor in determining the cost of service. Using the household demand characteristics for wastewater services, the distribution of rental values for housing services as a proxy for wealth, the model was solved to yield a series of optimal prices for each population density group. The normative decision parameter, which explicitly sets forth the value judgments concerning household welfare, determines which price of the series best meets the values of the community. Four alternative pricing rules were compared with the optimal price series to evaluate the welfare effects. In most cases, if equity is a strong social objective, the optimal price is equal to average cost, not marginal cost. Marginal cost pricing is optimal only in the sense that equity objectives are ignored or do not matter. Even with cost pricing, however, a distinction must be made among user groups to avoid the welfare losses that result from charging a uniform price over time and space.
W79-01544

TRICKLE-BED REACTOR PERFORMANCE, PART 1: HOLDUP AND MASS TRANSFER EFFECTS,
California Univ., Davis. Dept. of Chemical Engineering.
S. Goto, and J. M. Smith.
AIChE Journal, Vol. 21, No. 4, July, 1975, p. 706-713. 9 fig, 1 tab, 22 ref. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(2).

Descriptors: *Chemical reactions, *Mass transfer, Coefficients, Trickle-bed reactors, *Gas-to-liquid transfer.

Liquid holdup and mass transfer rates were measured in a 2.58-cm I.D. tube, packed with glass beads and granular CuO:ZnO catalyst or beta-naphthol particles, and operated as a trickle bed. Gas-to-liquid (water) transport coefficients were determined from adsorption and desorption experiments with oxygen at 25C and 1 atm. Liquid-to-particle mass transfer was studied using beta-naphthol particles. Holdup and both mass transfer coefficients were unaffected by gas flow rate but increased with liquid rate. The data were correlated with equations that could be used for predicting mass transfer coefficients at high temperatures and pressures for use in the reaction studies reported in Part II. (See also W79-01566) (Snyder-Calif, Davis)
W79-01565

TRICKLE-BED REACTOR PERFORMANCE, PART II: REACTION STUDIES,
California Univ., Davis. Dept. o
S. Goto, and J. M. Smith.
AIChE Journal, Vol. 21, No. 4, July, 1975, p. 714-720. 11 fig, 3 tab. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(3).

Descriptors: *Water purification, *Oxidation, Mass transfer coefficients, Filters, *Trickle-bed reactors, *Reaction, Kinetics, Waste water treatment, Formic acid.

Dilute solutions (132 ppm) of formic acid in water were oxidized with air in a trickle-bed reactor at 212C to 240C and 40 atm. Particles 0.291 and 0.0541 cm in diameter, prepared from a commercial CuO:AnO catalyst, were used to provide a model system for studying water purification by catalytic oxidation. Differential reactor runs were made to measure the global rate of reaction. These data were compared with predicted rates from the known intrinsic kinetics and intraparticle diffusivities, and the mass transfer coefficients were measured in Part I. High conversion (of formic acid) data were also obtained in order to test models for trickle-bed reactors. Experimental conversions agreed reasonably well (within 10%) with predicted values based upon intrinsic kinetics and the several transport rates. Axial dispersion was found to be less important than gas-to-liquid mass transfer and intraparticle diffusion. In our laboratory studies (reactor I.D. = 1 in.) careful arrangements were made to obtain nearly uniform distribution of liquid over the reactor cross section. Hence effects of maldistribution, which may be important in large-scale reactors, were minimized. (See also W79-01565) (Snyder-Calif, Davis)
W79-01566

MASS TRANSFER IN PACKED BEDS WITH TWO-PHASE FLOW,
California Univ., Davis. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2K.
W79-01567

CATALYTIC OXIDATION OF FORMIC ACID IN WATER. INTRAPARTICLE DIFFUSION IN LIQUID-FILLED PORES,
California Univ., Davis. Dept. of Chemical Engineering.
G. Baldi, S. Goto, C.-K. Chow, and J. M. Smith.
Ind. Eng. Chem., Process Des. Develop., Vol. 13 No. 4, 1974, p 447-452. (Univ. of California Water Resources Center Project UCAL-WRC-W-392) OWRT A-051-CAL(1).

Descriptors: *Water pollutant treatment, Waste water treatment, *Oxidation, Formic acid, Diffusion, Catalytic oxidation, Porosity, Catalysts.

Liquid-phase oxidation with a solid catalyst provides a potential method for the removal of dissolved pollutants. A commercial CuO-ZnO catalyst was found to be effective for converting dilution solutions of a test pollutant, formic acid, to carbon dioxide at 200-240C. To prevent the presence of a vapor phase the operating pressure was maintained at 40 atm. Rate measurements showed the reaction to be first order with respect to both dissolved oxygen and formic acid concentrations. In the presence of formic acid solutions the catalyst could be reduced when the oxygen concentration was low and oxidized at higher oxygen concentrations. Possibly the activity of the catalyst is explained by an oxidation-reduction mechanism. Measurements with large catalyst particles (0.477 cm diameter) showed severe retardation of the rate; effectiveness factors as low as 0.11 were obtained. Tortuosity factors (approximately 1.8 were lower than would be expected for gas-filled pores. The intrinsic activation energy was about 5 kcal/mol while the apparent value for 0.477-cm particles was 24 kcal/mol. (Snyder-Calif, Davis)
W79-01572

VEHICLE WASHING OPERATIONS AND WASTEWATER DISCHARGES, FORT DRUM, NY -- FINDINGS AND RECOMMENDATIONS,
Construction Engineering Research Lab., Champaign, IL.
R. J. Fileccia, L. J. Benson, K. A. Conley, and J. E. Matherly.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 17 Price codes: A03 in paper copy, A01 in microfich Technical Report No. E-80, June 1976. 47 p, 12 fi 12 tab.

Descriptors: *Waste water treatment, *Surveys, *Costs, *Design, *Technology, Water pollution treatment, Fort Drum, New York, Army vehicle, Sedimentation, Filtration, Oily water, Oil waste

A survey was carried out of Army vehicle washing facilities, and waste water discharges resulting from these activities at Fort Drum, New York. On the basis of the survey data and information supplied by post personnel, a concept design and cost estimates were prepared for a new consolidated washrack facility to replace existing facilities. The recommended design incorporates hand-held, high pressure/low volume wash hoses for tracked vehicles and fixed nozzle drive-through facilities for wheeled tactical equipment. The proposed centralized waste water treatment system consists of a sedimentation basin equipped for mechanical free oil removal, followed by filtration through a polishing filter. (Majtenyi-IPA)

79-01573

EASIBILITY OF RECYCLING LAUNDRY ASTEWATERS AT MILITARY QUARTER-ASTER LAUNDRIES,
rmy Facilities Engineering Support Agency, ort Belvoir, VA. Research and Technology Div.
W. Ford.
vailable from the National Technical Information rvice, Springfield, VA 22161 as AD-A038 705, ice codes: A03 in paper copy, A01 in microfiche. nal Report No. USAFESA-RT-2016, March 77. 43 p, 8 fig, 40 ref.

escriptors: *Waste water treatment, *Water pol-ion, *Recycling, *Cost analysis, Laundries, Co-ulation, *Flotation, Chemical reactions, Evalua-n.

study was performed to determine if reclaiming ndry waste waters at military quartermaster ndries would be economical. Several potential atment systems were designed and evaluated, luding chemical and physical methods, such as agulation by aluminum sulfate, activated pow-ed carbon with a polyelectrolyte, and induced flotation. Usage, costs, designs, comparisons, d assumptions are described in detail and an nomic analysis was performed. It was conclud-that laundry waste water recycling is currently economical and there is no indication that pres-conditions will change dramatically enough in near future to warrant future study of laundry ctices. (Majtenyi-IPA)
79-01574

FECT OF OZONE AND CHLORINE ON 3,4-NZOPYRENE DURING THE DISINFEC-ON OF WATER (DEYSTVIYE OZONA I LORA NA 3,4-BENZPIREN PRIOBEZZAR-HIVANII VODY),
D. Gabovich, I. L. Kurinnyy, and Z. P.
lorenko.
ailable from the National Technical Information vice, Springfield, VA 22161 as AD-A038 408, ce codes: A02 in paper copy, A01 in microfiche. . Naselennykh Mest., No. 8, p 88-91, 1969. nslated by Army Medical Intelligence and In-nation Agency, Washington, D.C., Translation USAMIIA-K-4566.

scriptors: *Industrial wastes, *Chlorination, zone, *Chemical wastes, Organic chemicals, emical reactions, 3,4-benzopyrene, Toxicity, emical analysis, Water quality control, Water ution, Laboratory tests.

periments were carried out tracing the fate of benzopyrene dissolved in water and subjected ifferent kinds of treatment common to drinking er supply systems. This compound was chosen epresenting carcinogenic hydrocarbons known e part of the pollution produced by coke and e plants, oil refineries and gas works. Studies the effect of chlorine on 3,4-benzopyrene re-ed that the major products are 5-monochloro-benzopyrene which has not been studied for inogenicity and, to a lesser extent, 3,4-benzo-ene-5,8-quinone which is not carcinogenic. orine in semibound form, for example as chlo-ine, was ineffective for reducing 3,4-benzopyr-concentration. Ozonation proved more effec-than chlorination. It reduced 3,4-benzopyrene centration by a factor of 10 to 50 where chlor-ion reduced concentration only by a factor of 5 10. However, it was concluded that water not be completely freed from benzopyrene er practical conditions even after chlorination 0.5 to 2 hours or ozonation for 3 to 5 minutes. jtenyi-IPA)
9-01575

GAMMA-RAY COUNTING APPARATUS R EVALUATING THE FALLOUT REMOV-EFFECTIVENESS OF REVERSE-OSMOSIS TER PURIFICATION SYSTEMS,
stic Research Labs. Aberdeen Proving und, MD.
Thomson, S. Schiller, J. Goshorn, E. Kaufman, and C. Hollandsworth.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 749, Price codes: A02 in paper copy, A01 in microfiche. Report No. BRL-MR-2746, May 1977. 23 p, 6 fig.

Descriptors: *Radioactive wastes, *Radioactive techniques, *Gamma rays, *Radioisotopes, *Potable water, Iodine 131, Strontium 85, Cesium 134, Reverse osmosis, Monitoring, Laboratory tests, Water quality control, Water purification, Water pollution, Evaluation, Measurement, Equipment.

A gamma ray detection system for measuring concentrations of radioactive impurities and procedures for its calibration and use are described. The system is based on scintillation methods and emphasizes counting efficiency, calibration accuracy, and a minimum of sample preparation. It is capable of dose counting water samples in the range of activities from a few tens to a few millions of picocuries per liter in a time period of 30 minutes. Tests were carried out on samples containing three important isotokpes, iodine 131, strontium 90, ad cessium 137, which were processed through a reverse osmosis system. The attenuation of activity taking place as the stream was processed was monitored with an accuracy of a fraction of 1%. The accuracy of absolute dose level determinations was limited by the errors in the calibration standards at levels of a few thousand picocuries per liter and at lower levels, statistical uncertainty is dominant. (Majtenyi-IPA)
W79-01576

DEVELOPMENT OF TECHNIQUE FOR DETECTION OF LOW MOLECULAR WEIGHT CONTAMINANT IN PRODUCT WATER FROM WATER PURIFICATION OR WATER REUSE SYSTEMS,
Amicon Corp., Lexington, MA.
For primary bibliographic entry see Field 5A.
W79-01578

EXAMINATION OF THE PROBLEM OF RECUPERATIVE TREATMENT OF WASTE WATER IN THE CHEMICAL INDUSTRY (CONSIDERATII ASUPRA PROBLEMEI EPURARI RECUPERATIVE A APELOR REZIDUALE),
I. V. Robu.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 230, Price codes: A02 in paper copy, A01 in microfiche. Revista de Chimie (Bucharest), Vol 17, No. 10, p 627-635, 1966. 10 fig, 2 ref. Translated by Army Medical Intelligence and Information Agency, Washington, D.C. Translation No. USAMILA-K-7088.

Descriptors: *Industrial wastes, *Recycling, *Water pollution treatment, Distillation, Thiems equation, Chemical wastes, Organic wastes, Nitrobenzene, p-Nitrotoluene, Theoretical analysis, Laboratory tests, Fractional distillation, Azeotropes, Value engineering, Cost-benefit analysis, Costs, Pollution abatement, Technology.

The problem of waste water treatment in chemical plants is examined with emphasis on recuperative systems whereby hazardous substances which are difficulty soluble in water may be separated and reused. Cost effectiveness is considered, but major focus is on estimation of the degree of pollutant removal based on their physical properties. As an illustrative example, calculations were done for separations using a fractioning column having only a stripping section and heated by direct steam at atmospheric pressure. Equilibrium equations and curves were established for substances, such as nitrobenzene, which form azeotropes with water. These theoretical calculations yielded the number of theoretical plates needed of successful separation as well as steam consumption so that optimum design and economic efficiency could be determined. Using this method a highly favorable recovery of nitrobenzene was predicted. This prediction was verified in laboratory studies yielding 94% recovery. However, because fractionation at lower temperatures is advantageous, other experiments used column operating pressure of about 55 mm Hg to separate a water-p-nitrotoluene system at an average column temperature of 43 C. A recovery of 99% was obtained from a 0.1% solution of p-nitrotoluene. Diagrams of two recuperative treatment plats using this system at atmospheric pressure an vacuum are included which are currently being built in Romania. (Majtensyi-IPA)
W79-01579

UV-OZONE WATER OXIDATION/STERILIZATION PROCESS,
Westgate Research Corp., Marina del Rey, CA.
J. D. Zeff, R. Shuman, E. S. Alhadeff, J. Wark, and F. C. Farrell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 609, Price codes: A10 in paper copy, A01 in microfiche. Final Report No. 1602. November 1976. 207 p, 33 fig, 43 tab, 1 append. DAMD 17-75C-5013.

Descriptors: *Water purification, *Waste water treatment, *Ultraviolet light, *Ozone, Recycling, Mathematical models, Organic chemicals, Microorganisms, Research and development, Disinfection, Treatment facilities, Laboratory tests, Pilot plants, Spacecraft, Technology.

An ultraviolet light-ozone system for destroying organic compounds and microorganisms in waste water suitable for use in the Army MUST Program and NASA Manned Spcecraft is described. Both laboratory tests and mathematical models were used in developing bench scale and pilot-plant scale systems. The organics of special interest were hydroquinone, pyrogallol, xylenol, urea, and sodium, acetate. Ethanol, glycerol, glycine, and acetic acid were evaluated also. The UV-ozone process was found to be more effective than either UV or ozone alone in destroying organics and microorganisms in various waters. Studies, using mathematical models, indicated that a Unit Reactor Module of 5 KW power for treating hospital composite, reverse osmosis permeate will occupy 5-ft 6-in by 2-ft 6-in and will weigh 750 lbs. This will include 36-inch UV lamps and operate at 3 to 5 psig pressure. The UV-ozone system for manned spacecraft capable of accomodating a crew of five would be 7-in by 8-in, weigh 12 lbs, and consume 36 Whrs/lb water. Detailed evaluations of equipment performance and capabilities are included and recommendations are made of further research, both chemical and mathematical. (Mjtenyi-IPA)
W79-01581

CLEAN UP MIXED WASTE STREAMS -- THE TANK TRUCK WASHING EXAMPLE.
MITRE Corp., McLean, VA. METREK Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 557, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/9-77-007, and M77-2, April 1977. 10 p, 1 fig, 6 tab. 68-01-3188.

Descriptors: *Industrial wastes, *Waste water treatment, *Technology, *Water pollution control, *Tank trucks, Coagulation, Aeration, Filtration, Costs, Swedesboro, New Jersey, Water pollution, Separation techniques, Flotation, Hydrogen ion concentration, Sedimentation, Cost analysis.

A system of treating waste waters produced by the cleaning of tank trucks was developed and tested at the Swedesboro, New Jersey, terminal of Matlack Corp. Although tank truck cleaning produces only small quantities of waste water, the wide range of cargoes carried results in a high degree of variability in pollutional content as indicated by a table showing 21 tanker cargoes. To deal with such wide ranging pollutants, the system uses seven separate operations: oil separation, air flotation, chemical coagulation and pH adjustment, equilibration/sedimentation, mixed media filtration, carbon adsorption, and rotating filter-biofiltration. Each of these steps is described briefly and preliminary effluent data is tabulated. Cost of operating the system is about $50 per 1000 gallons or $750 a day. It is concluded that this system is effective for treating waste waters from tanker

cleaning that now go to municipal waste streams and may have applicability in a broad range of chemicals manufacturing industries. (Majtenyi-IPA)
W79-01583

TECHNICAL-ECONOMICAL SOLUTION TO THE PROBLEM OF EFFLUENTS IN AN INTEGRATED PAPER MILL (SOLUCION TECNICO-ECONOMICA DEL PROBLEMA DEL EFLUENTE EN UNA PLANT PAPELERA INTEGRADA EN OPERACION),
H. A. Del Roscio, and M. Davidovsky.
ATIPCA (Asociacion de Tecnicos de la Industria Papelera y Celulosica Argentina), Vol. 16, No. 4, p 45-56, 58-59, 1977. 1 appendix, 3 fig, 8 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Argentina, Water pollution treatment, Water pollution source, Wastes, Industrial wastes, Waste treatment, Pulp wastes, Effluents, Sedimentation, Aerated lagoons, Activated sludge, Foreign countries, South America, Costs, Capital costs, Operating costs, Groundwood mills, Printing paper, Writing paper, Corrugating medium(Fluting paper), Soda pulp mills, Bleached pulp mills, Chemical recovery.

A study is presented on effluent treatment possibilities at Celulosa Argentina SA. (Argentina), an integrated mill producing 130 tons/day of bleached and unbleached mechanical pulp, 130 tons/day of bleached and unbleached cold-soda pulp, and 300 tons/day of printing and writing papers and corrugating medium. Options considered included sedimentation and aeration lagooning of all effluents jointly (base alternative) and three alternatives associated with internal recovery of bark, mechanical pulp rejects, and fibers and fillers in papermaking, viz., separate secondary treatment of soda pulping effluents with the remainder of the effluents passing only through primary treatment (A), activated sludge treatment exclusively for the soda pulping effluents (B), and dilution of the soda pulping effluents coupled with primary treatment of the other effluents and mixing of the two streams (C). While alternatives A and B were immediately ruled out on the basis of space requirements of capital investiment needs, capital and operating costs were worked out in detail for the base alternative and for alternative C. Alternative C is shown to involve relatively low investment and operating costs and the latter are substantially offset by the internal recovery of materials. (Spckhard-IPC)
W79-01593

DISK FILTERS FOR EFFLUENT PURIFICATION (DISKOVYE FIL'TRY DLYA OCHISTKI STOCHNYKH VOD),
Ministerstvo Bumazhoni Promyshlennost (USSR).
A. Ya. Tipsev, V. P. Svitel'skii, and V. A. Kovba.
Bumazhnaya Promyshlennost, No. 2, p 26-28, February, 1978. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Filters, Water reuse, Recycling, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Waste treatment, Filtration, Effluents, Foreign countries, Specifications, Operation and maintenance, Efficiencies, Water purification, Water pollution control, Soviet Union(USSR), White water(Paper machines).

Multidisk filters, used for fiber recovery at paper mills, can be operated with a fibrous layer to recover all fiber fractions, or without the fibrous layer to serve as fractionators. Such filters have been installed at many Soviet paper mills in recent years. The specifications of these filters are tabulated, and a description is given of the installation, operation, and efficiency of the filters at Segezh and Svetogorsk mills (Eimco filters), Zhidachev mill (Fampa FS filters), and the Klaipeda boad mill (Jones filters). All these filters perform well and give a fiver recoveryof up to 95-97% and filler recovery of up to 92-93%. The filters can be used for any fiber-containing effluent, but they are most efficient for recovering fibers in white water from the manufacture of papers of low filler content. In all mills equipped with the filters the recovered fibers are reused and the clarified white water is recycle. For this reason their use for joint purification of white water and other paper mill effluents is not recommended. (Stapinski-IPC)
W79-01594

POTENTIAL FOR AN IMPROVED RETURN ON INVESTMENT IN THE PRODUCTION OF WOOD FIBERBOARD USING THE WET PROCESS (MOZNOSTI ZVYSENIA EFEKTIVNOSTI VYROBY DREVOVLAKNITYCH DOSAK MOKRYM SPOSOBOM),
Research and Development Inst. of Wood and Timber, Bratislava (Czechoslovakia).
F. Mytny.
Drevo, Vol. 32, No. 12, p 369-370, December, 1977. 16 ref.

Descriptors: *Pulp wastes, *Fiberboard mills, *Water pollution control, Economic impact, Wastes, Industrial wastes, Water pollution source, Water pollution treatment, Water reuse, Recycling, Costs, Operating costs, Capital costs, Waste treatment, Effluents, Return(Monetary), Closed systems.

The wet process developed by Defibrator AB. (Sweden) for the production of fiberboard gives a product with good quality, but the effluents generated result in environmental damage if is discharged directly into a recipient stream. Either an effluent treatment plant is constructed and operated at rather high costs, or an attempt is made to separate the organic materials from the effluent and use them as fodder material. A third alternative includes closing of water circuits in the plant resulting in zero discharge. While the treatment plant construction and operation results in substantially reduces return on investment, the third alternative has very little economic impact. The second alternative did not reach commercialization, because organics could be separated only partially from the effluent. It is concluded that whenever environmetal protection is mandated by law, the closing of water circuits presents an economically more advantageous alternative compared to construction and operation of an effluent treatment plant. (Trubacek-IPC)
W79-01595

PROCESS AND APPARATUS FOR INTRODUCING GAS BUBBLES INTO A LIQUID (PROCEDE ET DISPOSITIF POUR INTRODUIRE DES BULLES GAZEUSES DANS UN LIQUIDE),
Compagine Electro-Mecanique, Paris, (France),
J. Sterlini.
French Patent No. 2,355,554. January 20, 1978. 7 p, 2 fig, 5 claims.

Descriptors: *Patents, *Flotation, *Waste water treatment, *Pulp waste, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Bubbles, Aeration, Gases, Air, Water.

A flotation process, of use, for example, in treating papermaking effluents is designed to form in a bath bubbles having a diameter of less than 100 micrometers without producing currents which would break up flocks or unstable particle agglomerates. Specifically, an emulsion ofair in water, formed in known manner as a jet within the flotation bath, is deflected with an associated jet of water over a curved path within the bath such that the bubbles migrate from the emulsion jet to the water jet, from where they ascend through the bath. (Speckhard-IPC)
W79-01596

DECOLORING OF WATER-SOLUBLE AZO DYES BY OZONE (IN JAPANESE),
Gifu Univ. (Japan).
M. Matsui, Y. Satoh, K. Shibata, and Y. Takase.
Journal of the Society of Fiber Science and Technology Japan (Sen-i Gakkaishi), Vol. 34, No. 4, p T181-T186, April, 1978. 10 fig, 12 ref, 3 tab. English summary.

Descriptors: *Dyes, *Ozone, *Decoloring, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Water pollution treatment, Organic compounds, Color, Degradation(Decomposition), Chemical degradation, Azo dyes.

The reaction of ozone with the water-soluble azo dye C.I. Acid Orange 12 is of a pseudo first-order. It involves mainly attack on the N=N bonds in mono-azo dyes and cleavage of the aromatic rings to yield carboxylic acids. The decomposition involves intermediates containing active oxygen atoms. The reaction is accelerated by dissociation of OH groups in the dye molecule and by self-decomposition of ozone. (Brown-IPC)
W79-01599

CHARACTERIZATION OF VARIOUS CONDENSATE STREAMS IN THE KRAFT PROCESS,
National Council of the Paper Industry for Air and Stream Improvement Inc., New York.
M. E. Franklin.
NCASI Stream Improvement Technical Bulletin, No. 310, 33 p, April, 1978. 1 appendix, 15 fig, 1 illus, 10 tab.

Descriptors: *Pulp wastes, *Condensates, *Kraft mills, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Evaporation, Biochemical oxygen demand, Alcohols, Evaporators, Waste treatment, Water pollution treatment, Water pollution control, Methanol, Black liquor.

This study carried out by the NCASI West Coast Regional Center showed that methanol contributes about 35% of the BOD present in kraft mill condensates from multiple-effect black liquor evaporators. The sequence in which weak liquor is introduced to evaporators was shown to affect the distribution of BOD in the condensate streams from individual evaporator effects. To concentrate the bulk of the BOD in the smallest volume of condensate, weak liquor feed to the last stream effect was found to be most effective. Introduction of weak liquor at a point further down the evaporation step distributes the same amount of BOD into a larger condensate volume. The study also confirmed that digester condensates and turpentine decanter underflow streams are logical candidates for internal process load reduction schemes such as reuse or selective treatment. (Swichtenberg-IPC)
W79-01601

ELIMINATION OF IMPURITIES CONTAINED IN KRAFT MILL CONDENSATES (BADANIA NAD USUWANIEM ZANIECZYSZCZEN WYSTEPUJACYCH W KONDENSATACH Z CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
U. Lubienska.
Przeglad Papierniczy, Vol. 34, No. 3, p 88-91, March, 1978. 4 fig, 1 ref, 4 tab. English summary.

Descriptors: *Pulp wastes, *Condensates, *Waste water treatment, *Kraft mills, Pulp and paper industry, Steam, Waste treatment, Water pollution treatment, Water pollution sources, Water purification, Air, Wastes, Industrial wastes, Chemical oxygen demand, Sulfides, Sulfur, Methanol.

The possible utilization of condensates from digester relief and black liquor evaporators and the resulting reduction of freshwater demand have been discussed in an earlier report. This article deals with the content of impurities in the condensates and with the elimination of volatile impurities by air or steam stripping. Condensates from digester relief gases and from a multiple-effect evaporator were analyzed for their COD, methanol, dry solids, sulfur, and sulfides contents, and samples of these condensates were treated with air and steam in a Vigreux column connected to two condensers. Considerable differences were found in the concentrations of individual impurities at various production points. Thus, the condensates should

ollected and treated separately for maximum puri-cation efficiency. For example, the concentration methanol was high in digester relief condensates id accounted for up to 80% of their COD. When erated under optimum conditions (air volume 60 nes that of condensate), the purification efficien- was 11% when condensates at 70C were treated ith air, about 35% when the temperature was 0C, and about 70% when steam was used for eatment. (Stapinski-IPC)
79-01602

UBMERSIBLE PUMPS ARE PROVEN IN EF-LUENT SYSTEM AT NEWTON FALLS (NEW ORK),
ewton Falls Paper Mill Inc., NY.
Piiparinen.
lp and Paper, Vol. 52, No. 6, p 126-127, June, 78. 1 fig, 2 illus.

escriptors: *Pulp wastes, *Sludge, *Pumps, astes, Industrial wastes, Water pollution sources, lp and paper industry, Solid wastes, Flow rates, aste paper, Coated paper, Printing paper, Acti-ted sludge.

ur Flygt electric submersible pumps which are ntained in a 8 x 20 x 13 ft deep wet well, are mping sludge (50% biologically active) from the ondary clarifiers back to the two aeration basins the deinked waste paper pulp and coated/un-ated printing paper mill of Newton Falls Paper ll Inc. When the sludge flow from the clarifiers ceeds the requirements of the aeration tanks, dge is pumped to one of the primary oxidation toons by two smaller Flygt pumps. Average w of sludge into and out of the pumping station ,000 gal/min. (Swichtenberg-IPC)
79-01603

XYPHOTOLYSIS' -- PROCESS FOR EFFLU-T CONTAMINANTS,
H. Harwood.
cycling and Waste Disposal, Vol. 2, No. 6/7, p -157, July/August, 1977. 2 fig, 1 illus, 1 tab.

scriptors: *Pulp wastes, *Waste water treat-nt, *Ozone, *Ultraviolet radiation, Wastes, In-strial wastes, Waste treatment, Water pollution atment, Water pollution sources, Pulp and paper ustry, Effluents, Oxidation, Chlorinated hydro-bon pesticides, Kraft mills, Cyanides.

new broad-spectrum effluent treatment process, ginally developed as a treatment method for tal-complexed cyanide wastes from the electro-ting and photographic processing industries, has ently been introduced to the European market. e to the energy input from UV radiation, the ilable oxidation energy per molecule of ozone is reased by up to 35%. This is due to the en-cement of the reaction between ozone and ter to form hydroxyl radicals, which have a her oxidation potential (2.80 volts) than ozone 7 volts). Additionally a portion of the UV iation can excite the contaminant species to der it more susceptible to oxidation. The proc-also destroys chlorinated organics and organic phosphorus pesticides such as malathion. The photolysis process compares favorably with tment using ozone alone in decoloring un-ched kraft mill effluent. Treatment of a kraft effluent stream of 1,000,000 gal/day would uire an ozone dosage of 5,000 lb/day when g ozone alone; under Oxyphotolysis, the age would be only 1,350 lb/day. (Witt-IPC)
9-01604

ESTOCK FARMING AND ENVIRONMEN-L PROTECTION, (IN GERMAN),
Riemann.
dtechnik, Vol. 28, No. 5, p. 149-153, March, 3. 9 fig.

criptors: *Livestock, *Waste treatment, *Eco-ics, Aerobic conditions, Anaerobic conditions, erobic conditions, *Farm wastes, *Germany.

The livestock industry is confronted more and more with problems of environmetal protection linked to costs threatening its competitiveness. The aims of manure treatment regarding odors, pathogens and volume reduction by clarification are considered. Agricultural use of manure appears to be the most economical method. For biological degradation of manure, two detchniques are presented. Anaerobic decompostion yields strong smelling decay products and depends mostly on outside temperatures. In aerobic decomposition few or no offensive smells are created because of the aerobic bacteria. Aerobic degradation is suitable for different types of manure, proceeds quickly and develops its own heat. The aerobic operations of oxidation ditches, oxidation silos, forced-air systems, and their possible improvement are discussed. Composting also involves aerobic biological degradation and is more desirable hygienically. However its marketability is limited by lack of effective cost defrayments. (Solid Waste Information Retrieval System).
W79-01605

MOBILE CENTRIFUGAL UNIT FOR USE IN DEWATERING PAPER SLUDGES (DIE FAHRBARE ZENTRIFUGENANLAGE BEIM EINSATZ ZUR ENTWAESSERUNG VON PAPIERSCHLAEMMEN),
VEB Komplette Chemieanlagen, Dresden (East Germany).
For primary bibliographic entry see Field 5E.
W79-01606

USE IN THE BRICK INDUSTRY OF HIGHLY DISCOLORED FIBERS RECOVERED FROM THE FINAL EFFLUENT CLARIFIER OF A PAPER MILL (VERWERTUNG VON STARK VERFAERBTEM FANGSTOFF AUS DER REST-ABWASSERKLAERANLAGE EINER PAPIER-FABRIK IN DER ZIEGELINDUSTRIE),
VEB Druck- und Spezialpapiere, Golzern (East Germany).
For primary bibliographic entry see Field 3E.
W79-01607

ADVENTURES IN DESIGNING FOR 1984 EFFLUENT REDUCTION,
Gulf States Paper Corp., Tuscaloosa, AL.
For primary bibliographic entry see Field 5G.
W79-01608

TREATMENT OF BLEACH PLANT EFFLUENTS BY COMBINED REVERSE OSMOSIS AND FREEZE CONCENTRATION PROCESS,
Institute of Paper Chemistry, Appleton, WI.
A. J. Wiley, L. E. Dambruch, P. E. Parker, and H. S. Dugal.
Presented at TAPPI Environmental Conference, Washington, DC., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 63-70. 5 fig, 9 ref, 10 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Reverse osmosis, *Freeze concentration, Wastes, Industrial wastes, Pulp wastes, Sulfite liquors, Water pollution treatment, Water pollution sources, Osmosis, Membrane processes, Membranes, Pulp and paper industry, Water conservation, Water reuse, Recycling, Capital costs, Operating costs, Costs, Pilot plants, Waste treatment, Cellulose acetate, Sulfite pulp mills, Kraft mills.

Bleach plant effluents containing 0.5% solids are concentrated to 5% solids by reverse osmosis in pilot-plant studies conducted by the Institute of Paper Chemistry (Appleton, Wisconsin) at the calcium-base sulfite mill of Flambeau Paper Co. (Park Falls, Wisconsin) and at kraft mills of the Continental Group (Augusta, Georgia) and Chesapeake Corp. (West Point, Virginia). The first freeze concentration (F.C.) stage concentrates the effluent from 5 to 15% which in turn is concentrated to 25% by the second F.C. stage. Approximately 97-98% of the effluent can be recovered as high-quality water that could be recycled to the pulp mill. The Concentrate from the F.C. process, i.e., 2-3% of the effluent flow, contains 90-95% of the total solids and 100% of the total color. At current levels of water consumption in the bleach plant, operating costs are $20-30/ton of bleached pulp (about $2.50/1000 gal of effluent) and capital costs are about $30,000/daily ton of bleached pulp. Reducing water consumption from 10,000 to 5,000 gal/ton would reduce operating charges to the $12-15/ton range and reduce capital costs to about $16,000/daily ton of production. If cellulose acetate reverse osmosis membrane suppliers could double or triple the expected membrane life, operating costs would drop to a competitive level. The reverse osmosis/F.C. process can be readily piped to an existing system, and extensive renovation is not required. (Swichtenberg-IPC)
W79-01610

STUDIES OF MEMBRANE PROCESSES FOR PULP MILL POLLUTION CONTROL,
St. Regis Paper Co., Pensacola.
G. Maples, and E. W. Lang.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 71-82. 17 fig, 5 tab.

Descriptors: *Pulp wastes, Bleaching wastes, *Waste water treatment, *Membrane processes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Membranes, Color, Separation techniques, Reverse osmosis, Costs, Economics, Biochemical oxygen demand, Dissolved solids, Organic compounds, Carbon, Sodium compounds, Operation and maintenance, Pilot plants, Florida, Osmosis, Waste treatment, Computer programs, Cellulose acetate, Polysulfone, Ultrafiltration, Decoloring, Kraft mills.

Ultrafiltration and reverse osmosis processes using polysulfone and cellulose acetate membranes, respectively, were evaluated for their application in purifying effluent from a pulp mill screen room and for removal of color from caustic bleach plant effluent. The tests were done in a tubular-membrane pilot plant in Florida. Graphical and tabular data are presented to show the effects of operating pressure, velocity, and solids concentration on flux and rejection of contaminants, viz., color, total organic carbon, BOD, total dissolved solids, and sodium. A computer program was designed to predict the steady-state concentration of contaminants, optimum operating conditions, and costs for membrane systems. Examples are presented of how membranes might be used in a kraft mill and the resulting rejections of color and other contaminants in the mill effluent. Pilot-plant results indicate that in-plant color removal by membranes is competitive with the costs of external treatment methods. (Swichtenberg-IPC)
W79-01611

SUCCESSFUL MEAD (CORPORATION) PROGRAM TO REDUCE EFFLUENT VOLUME,
Mead Corp., Kingsport, TN.
R. W. Self, and K. C. Ayers.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 83-87. 1 ref, 2 tab.

Descriptors: *Pulp wastes, *Sludge, *Water pollution control, Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Tennessee, Biochemical oxygen, Suspended solids, Effluents, Pulp and paper industry, Recycling, Water reuse, White water(Paper machines), Soda pulp mills, Fine-paper mills.

Raw waste loads to the primary and secondary (aerated stabilization basin) effluent treatment facilities were reduced from an average 16,500,000 gal/day in 1975 to 12,300,000 gal/day in late 1977 by an in-plant program conducted at a bleached soda pulp and fine-paper mill in Kingsport, Tennessee. The BOD (lb/day) of the raw waste load decreased while the concentration increased slightly. The decrease in the lb/day of total suspended solids was significant while the concentration was

also decreased slightly. In-plant projects to reduce effluent volume included recycling the white water from the high-speed fine-paper machine to the freshwater treatment plant; the development of a cooling-water system; use of excess clarified white water for stock dilution at the pulper, high-density fiber storage tank, and brown stock decker; and air purging of coating color on on-machine coaters during paper grade changes. (Swichtenberg-IPC)
W79-01612

COMPONENTS OF A SUCCESSFUL IN-MILL CLOSE UP PROGRAM,
Consolidated Papers, Inc., Whiting, WI.
D. J. Czappa.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 89-99. 6 fig, 5 tab.

Descriptors: *Pulp and paper industry, *Water conservation, Water reuse, Water pollution control, Wastes, Industrial wastes, Water pollution sources, Wisconsin, Industrial water, Suspended solids, Biochemical oxygen demand, Pulp wastes, Activated sludge, Groundwood mills, Printing paper, White water(Paper machines).

In-mill close-up procedures implemented during the period from 1974 to 1977 at the Wisconsin River Division of Consolidated Papers, Inc. (Whiting, Wisconsin) were largely responsible for the success of the activated sludge effluent treatment plant. Suspended solids and 5-day BOD discharges amounted to 8.5 and 10 ppm or 10 and 20% of the allowed Best Practical Technology (BPT) discharge limits (July 1977), respectively. Water consumption at the groundwood pulp and lightweight coated printing paper mill was reduced from 4,100,000 to 2,900,000 gal/day. Modifications in the collection and reuse systems are described for heavy and clarified white water, press section water, vacuum pump seal water, hot water, and groundwood white water. (Swichtenberg-IPC)
W79-01613

SPILL CONTAINMENT AND EFFLUENT MANAGEMENT PROGRAM AT THE HOPEWELL MILL, CONTINENTAL FOREST INDUSTRIES, THE CONTINENTAL GROUP, INC.,
Sirrine (J. E.), Co., Raleigh, NC.
A. B. Browner, I. K. Core, and D. C. Muntz.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 101-108. 2 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Municipal wastes, Waste treatment, Water pollution treatment, Water pollution sources, Virginia, Effluents, Pulp and paper industry, Spills, Kraft mills, Linerboard mills, Corrugating medium(Fluting paper), Semichemical pulp mills.

The semichemical corrugating medium and kraft linerboard mill of Continental Forest Industries decided to meet 1977 effluent treatment requirements by participating in a large regional treatment plant and interceptor system operated by the City of Hopewell, Virginia. Accidental spills of concentrated chemicals in the brown stock washer, evaporator, recovery furnace, and causticizing areas were identified as a potential threat to the regional plant. A spill containment and effluent management system was established within the mill to reduce the frequency and impact of spills. Major design considerations for the system are described. (Swichtenberg-IPC)
W79-01614

OPERATING EXPERIENCES AT LONGVIEW FIBRE COMPANY'S PURE OXYGEN ACTIVATED SLUDGE SYSTEM,
CH2M/Hill, Corvallis, OR. Industrial Processes Div
G. Peterson, J. Klein, and D. Martinsen.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 139-147. 6 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Operation and maintenance, *Washington, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper mills, Sulfite liquors, Oxygen, Sludge, Sludge treatment, Dewatering, Biochemical oxygen demand, Suspended solids, Effluents, Spills, Condensates, Kraft mills, Sulfite pulp mills.

Highlights of a 10-year program to reduce the volume and pollutant levels of effluent at a kraft (bleached and unbleached) and neutral sulfite semichemical (NSSC) mill in Washington include in-mill projects (viz., conversion of brown stock washing lines from 3 to 4 stages, steam stripping of digester and evaporator foul condensates, and collection and containment of pulp mill liquor spills), startup of a UNOX activated sludge treatment plant, and the purchase of two belt presses for sludge dewatering. Operating characteristics and problems are discussed for both the UNOX process and sludge-dewatering presses. Average effluent discharge levels for 5-day BOD and total suspended solids are 5,700 and 23,200 lb/day, respectively. (Swichtenberg-IPC)
W79-01615

DESIGN AND OPERATION OF GREAT NORTHERN PAPER COMPANY'S SECONDARY TREATMENT FACILITIES AT EAST MILLINOCKET, MAINE,
Jordan (Edward C.) Co., Inc., Portland, ME.
A. J. Condren, and P. H. Welch.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 149-156. 4 fig, 6 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Maine, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution souces, Pulp and paper industry, Aerated lagoons, Biochemical oxygen demand, Suspended solids, Nutrients, Neutralization, Sludge treatment, Dewatering, Operation and maintenance, Effluents, Newsprint mills.

Startup of the secondary effluent treatment system (an aeration basin with a retention time of 31 hr) occurred on October 1, 1976 at Great Northern Paper Co.'s 1000-ton/day newsprint mill in East Millinocket, Maine. Upon obtaining proper operational parameter control, the system has yielded an effluent of a quality superior to the average allowable discharge, i.e., 7,700 lb 5-day BOD/day and 6,800 lb total suspended solids/day. Data are presented depicting the statistical reliability of the system for 5-day BOD and total suspended solids removal, the nutrient and neutralization requirements, the secondary solids generation, and the secondary sludge dewatering system performance. In addition, operational problems encountered and corrective actions taken are addressed. (Swichtenberg-IPC)
W79-01616

THE RELATIONSHIP OF BIOLOGICAL POPULATION TO ACTIVATED SLUDGE PLANT PERFORMANCE,
Westvaco Corp., Covington, VA.
C. T. Bell.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 171-187. 5 fig, 17 illus, 3 ref.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, *Biological communities, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Pulp and paper industry, Water pollution sources, Temperature, Hydrogen ion cooncentration, Dissolved oxygen, Toxicity, Virginia, Performance, Treatment facilities, Aerated lagoons.

Laboratory studies showed that the acclimated biological population retained in an aeration by suspension cannot tolerate erratic changes in temperature, pH, dissolved oxygen level, and toxicity. A temperature over 103F had a significant influence on the bactericidal effects of cooking liquor and dispersed rosin sizing. Since 1970 the operating efficiency at the activated sludge treatment plant of Westvaco Corp. (Covington, Virginia) has been reliably predicted by microscopic examination of the aeration bay suspension. Instantaneous information can be obtained regarding the health status of the overall biological population, the characteristics of floc formation, and the content of nonbiologically degradable materials. (Swichtenberg-IPC)
W79-01619

AUSTRIAN NATIONAL REPORT ON NON-WASTE TECHNOLOGY,
For primary bibliographic entry see Field 3E.
W79-01621

HOW AND WHY WE CHOSE INTEGRAL RECYCLING (AT THE ISOREL FIBERBOARD PLANT, CASTLEJALOUX, FRANCE),
Isorel, Puteaux (France).
For primary bibliographic entry see Field 3E.
W79-01622

THE OUTLOOK FOR PROGRESS AND TECHNOLOGICAL METHODS IN A PAPER INDUSTRY CONFRONTED WITH ENVIRONMENTAL PROBLEMS,
Centre Technique de Papier, Grenoble (France).
P. Monzie.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 365-378. 1 fig, 1 tab.

Descriptors: *Pulp and paper industry, *Pollution abatement, *Technology, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Air pollution, Pulp wastes, Bleaching wastes, Water pollution control, Storage requirements, Treatment facilities, Logging wastes.

Points of origin of pollutants and wastes in pulp and paper production are reviewed, and problems involved in the utilization of slash and other forest residues are discussed. The prospects of new low-pollution pulping and bleaching processes are analyzed. By 1985 several new principles will be in operation at pulp mills, notably ecology-conscious utilization of al forest and agricultural residues; more compact pulp-manufacturing units with minimizied air pollution in the immediate mill vicinity; and dimensional reduction or elimination of large storage areas and waste-treatment facilities. Cooperative efforts required to reach this stage are specified. (Brown-IPC)
W79-01623

NON-WASTE PRODUCTION OF BLEACHED KRAFT PULP,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 3E.
W79-01624

REDUCTION OF THE WATER-POLLUTING DISCHARGES FROM A BLEACHED SULFATE PULP MILL (REDUCTION DE LA CHARGE DE POLLUTION DE L'EAU PROVENANT D'UNE USINE DE PATE AU SULFATE BLANCHIE),
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
P. Lieben.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 385-403. 3 fig, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Kraft mills, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Economics, Biochemical oxygen demand, Color, Bark, Bleaching wastes, Recycling, Ion ex

ange, Oxygen, Water pollution control, Foreign untries, France, Pulp washing, Black liquor, eaching, Condensates, Decoloring.

ıe French Environmental Protection Agency CDE, Direction de l'Environnement) has been pporting studies on external effluent treatments d related technologies aimed at water pollution atement by bleached kraft mills. The economies such measures are discussed, notably the costs of OD and color reductions via dry barking, im-ɔved pulp washing, spent liquor evaporation, eaching waste recycling, ion-exchange, oxygen eaching, and condensate treatment. (Brown-IPC)
79-01625

OLOGICAL METHOD FOR PURIFYING RAFT PULP MILL CONDENSATES,
so-Gutzeit Osakeyhtio, Imatra (Finland).
Vettenranta.
Non-Waste Technology and Production, Per-non Press, 1978, p 415-419. 4 tab.

scriptors: *Pulp wastes, *Waste water treat-nt, *Biological treatment, Water pollution rces, Water pollution treatment, Wastes, Indus-l wastes, Waste treatment, Foreign countries, tration, Filters, Bark, Pulp and paper industry, trients, Toxicity, Sulfur bacteria, Sulfur com-unds, Effluents, Water pollution control, ftwood, Europe, Finland, Condensates, Kraft ls.

e Enso-Biox process of removing odorous and ic sulfur compounds from kraft evaporator and ester condensates is outlined, including pilot-nt and full-scale biofilter studies at Uimaharji, land. The liquid and gas filters use a filtering dium of softwood bark treated with a nutrient xture to support growth of the sulfur bacteria. er being purified in the liquid units, the conden-es are clean and safe enough to be released into water system. Because the air which is blown ough the liquid units becomes contaminated in process, it is purified in the gas filter unit ore being released into the atmosphere. The filter is much cheaper to build and operate than eam-stripping unit. (Brown-IPC)
9-01626

O EXAMPLES OF LOW EMISSION TECH-LOGIES IN THE PULP AND PAPER IN-STRY,
unhofer-Gesellschaft fuer Foerderung der gewandten Forschung e. V., Karlsruhe (Ger-ny, F. R.).
Jochem.
Non-Waste Technology and Production, Per-non Press, 1978, p 469-479. 2 fig, 22 ref, 4 tab.

scriptors: *Pulp and paper industry, *Water pol-on control, Water pollution sources, Pulp tes, Bleaching wastes, Wastes, Industrial tes, Water conservation, Foreign countries, rope, Corrosion, Slime, Productivity, Pine trees, uents, Chlorine, Closed systems, White er(Paper machines), Coated paper, Hydrogen oxide, West Germany, Sulfite pulps, Spruce s(Picea), Beech trees(Fagus).

outline of the productivity, structure, and emis-s of the West German pulp and paper industry ollowed by descriptions of two typical low-ution manufacturing methods which have been eloped with active federal research support. e of these methods involves the substitution of rogen peroxide for chlorine in bleaching sulfite ps; the other deals with the closed-circuit manu-ure of coated papers. Hardwood sulfite pulps ., rayon-grade beech dissolving pulp) have n bleached by P (peroxide)-D (chlorine diox-H (hypochlorite), P-H-D, or P-H-D-H se-nces in which chlorine was completely re-ed by peroxide; for softwood (spruce or pine) er pulps a chorine prebleach was required, but dosage could be reduced from the usual 5-7% 02%. High-quality fine papers have been pro-ed on paper machines with nearly completely ed white water circulation without significant ct on product specifications, but some operat-ing problems (corrosion, slime, etc.) require further research ad development work. It is estimated that 20% of all paper can be produced without any waste water discharge, and another 70% with considerable water conservation, for a total 60-70% reduction of water consumption. (Brown-IPC)
W79-01627

LIQUID MANURE AND ENVIRONMENT PROTECTION, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01628

FIELDS OF USE AND APPLICATION OF MANURE AND MANURE DISPOSAL, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01633

UTILIZATION AND DISPOSAL OF LIQUID MANURE AT SMALL AVAILABLE SPACE, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01640

PROCESS AND APPARATUS TO TREAT PUTREFACTIVE WASTE FROM RAW FISH AND MEAT.
Belgian Patent BE-842-053. Issued September 16, 1976. Derwent Belgian Patents Report, K(41):03, November 17, 1976.

Descriptors: *Dewatering, *Waste water treatment, *Waste disposal, Energy conversion, Heat treatment, Fertilizer, *Meat processing wastes.

A process and apparatus to treat putrefactive waste from raw fish and meat was patented. It can treat such material rapidly without causing odor. The waste from domestic or industrial kitchens moves between grinding rollers and into a chute, then to an endless screw type grinder. Solids are separated and move through dehydrating rollers to an ultraviolet sterilizing chamber; they are dried by hot air in a perforated drum on their way to a receptacle. The separated liquid flows to a stirrer where a deodorizing liquid is added to the mixture, goes to a header tank, and then to a concentrating tank where the pressure is reduced. Oil and water are separated by centrifugation and flow to separate reservoirs. The by-products may be used as fertilizer or animal feed. The oil recovered can be burned as fuel; the water can be further purified. (EPA-Corvallis)
W79-01647

KANAWHA RIVER INVESTIGATION OF WATER QUALITY AND WATER POLLUTION CONTROL PRACTICES. VOLUME II: REPORTS OF INDUSTRIAL INVESTIGATIONS ON SEVEN INDUSTRIES.
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 499, Price codes: A11 in paper copy, A01 in microfiche. July 1973. 226 p, 31 fig, 34 tab.

Descriptors: *Water pollution, *Industrial wastes, *Waste water treatment, *Kanawha River, West Virginia, Surveys, Effluents, Industrial plants, Pollutants, Waste disposal, Water quality control, Monitoring, Water usage, Sampling, Evaluation, On-site tests, On-site investigations, Rivers, Water pollution treatment.

The industrial treatment of waste waters discharged into the Kanawha River in West Virginia was investigated to determine if treatment is adequate and, if not, to ascertain what waste reductions are necessary to attain water quality standards. Studies were carried out by four industrial firms on seven industrial plants in the area. Each of the four, E. I. du Pont de Nemours, Union Carbide, FMC, and Monsanto, reported separately on their investigations. Each report describes plants and the wastes produced, existing waste treatment facilities, and waste water disposal. Specific data are supplied for each plant surveyed, including such information as discharges, sources, and flows of particular chemical pollutants, levels of biochemical oxygen demand loading, and comparisons of field studies carried out by Environmental Protection Agency laboratories with those done by the industrial laboratories. Also discussed are monitoring programs, spill potential, and future plans of the individual plants investigated. (Majtenyi-IPA)
W79-01654

ORGANIC IMPURITIES FROM INDUSTRIAL WASTE WATER REMOVAL - BY TREATMENT WITH ACTIVATED CARBON CONTAINING MANGANESE OXIDE(S) USEFUL IN CHEMICAL INDUSTRY.
Soviet Patent SU-494-929. Issued November 29, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 34, p 2, October, 1978.

Descriptors: *Patents, *Activated carbon, *Manganese, *Adsorption, *Industrial wastes, *Dyes, Heat treatment, Chemical wastes, Temperature, Ammonium compounds, Waste water treatment, Organic compounds, Chemical oxygen demand.

A patent has been granted for an adsorption process to treat aniline-bearing wastes from a dye works, wastes containing surfactants and dyes from an alkali plant, or municipal sewage having a high COD. Granular activated carbon containing manganese oxides in an amount of 3-6% by weight is employed as the adsorbent. In an example cited, the adsorbent was prepared by impregnating activated carbon with a 3-10% aqueous solution of manganese nitrate or sulfate, followed by air drying at 150-170C. The manganese-bearing carbon was then treated with a 6-12% ammonia solution, air heated to 250-280C, and rinsed until the Mn content of the washwater was less than 1 mg/liter. Columns of activated carbon bearing 3.5, 3.0, and 5.0% Mn were employed with the alkali, aniline, and sewage wastes, respectively; corresponding treatment efficiencies of 95.2-98.5%, 96.0-99.0%, and 92.5-96.0% were obtained. Regeneration of the adsorbent by passing a stream of air through the column at 250-280C instead of the 500-800C generally used substantially reduced losses during regeneration from the 5-10% normally obtained to 1.1-2.9%. (Schulz-FIRL)
W79-01703

METHOD FOR ADENOSINE 5'-TRIPHOSPHATE MEASUREMENT ON COKE WASTE ACTIVATED SLUDGE,
Alabama Univ. in Birmingham, Dept. of Biology.
J. Russell, and J. J. Gauthier.
Applied and Environmental Microbiology, Vol 35, No 2, p 450-452, Feb., 1978. 2 tab, 18 ref. OWRT A-060-ALA(1).

Descriptors: *Coke waste activated sludge, Inhibitors, *Activated sludge, *Adenosine 5'-triphosphate, Measurement, Waste water treatment, Waste identification, Sodium dodecyl sulfate.

Measurement of adenosine 5'-triphosphate (ATP) in coke waste activated sludge can provide a simple method for estimating the levels of viable microbes in the sludge. However, the presence of inhibitors such as phenol in the sludge interferes when the luciferin-luciferase method is used to measure ATP. These inhibiting substances can be removed from the sludge before extraction of ATP by washing the cells with dilute sodium dodecyl sulfate.
W79-01723

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W79-01729

REMOVAL OF COMPONENTS FROM WASTEWATERS GENERATED IN TEXTILE FINISHING PROCESSES. PART II. SEPARATION OF CONTENTS FROM WASTEWATERS. SIZE (ELIMINIERUNGEN VON INHALTSSTOFFEN IN ABWASSERN DER TEXTILVEREDLUNG-TEIL II TRENNUNG CON ABWASSER-INHALTSSTOFFEN, SCHLICHTE,
K. Fischer.
Melliand Textilberichte, Vol. 59, No. 7, p 582-588, 1978. 13 fig.

Descriptors: *Textiles, *Chemical precipitation, *Reverse osmosis, *Polymers, *Surfactants, Membrane processes, Solubility, Organic wastes, Separation techniques, Biological treatment, Waste water treatment, Industrial wastes.

General problems in eliminating organic components from waste waters generated in textile finishing processes are discussed with special regard to precipitation and reverse osmosis. The precipitation of water-soluble polymers decreases with an increase in polymer concentration in the influent. Although nonionic surfactants cannot be effectively precipitated by means of organic and inorganic agents, surfactant-bearing solutions can be concentrated by reverse osmosis with cellulose acetate membranes. Starch-based sizings can be eliminated directly by biological treatment; sizings based on poly(vinyl alcohol) or carboxymethyl-cellulose may require additional conditioning before biodegradation. Starches, polyacrylates, poly(vinyl alcohol), and carboxymethylcellulose can also be precipitated with iron salts. (Takacs-FIRL)
W79-01757

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENT (PART 3) - RECOVERY AND REUSE OF ALUM SLUDGE (PARUPU HAISUI GYOSHU SHORIHO NO KENKYU (DAI-SANPO) - RYUSAN ARUMINYUMU SHORI SURAJI NO KUROZU KA SHORI),
For primary bibliographic entry see Field 5E.
W79-01758

OPTIMIZE THE EFFLUENT SYSTEM. PART 6: BIOCHEMISTRY OF ACTIVATED SLUDGE PROCESS.
Standard Oil Co. (Indiana), Chicago, IL.
J. F. Grutsch, and R. C. Mallatt.
Hydrocarbon Processing, Vol. 55, No. 8, p 137-142, August, 1976. 7 fig, 2 tab, 15 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Enzymes, *Biochemistry, *Bacteria, Chemical reactions, Microorganisms, Biological treatment, Solid waste, Liquid wastes, Solubility, Suspended solids, Colloid, Performance, Optimization, *Biochemistry.

The biochemistry of activated sludge treatment is discussed, with particular emphasis on the role of enzyme reactions and the transport of substrate through the bacterial cell wall and membrane. Exoenzymes are needed to hydrolyze colloidal and suspended solids into smaller soluble molecules that can pass through cell membranes for food. However, these enzymes may be dispersed and lost in the effluent or destroyed by exposure to changes in pH, salinity, and other conditions. Endoenzymes on the other hand are at least partially protected from these environmental changes by the bacterial cell wall and membrane; thus, using the biological process for the removal of only soluble contaminants is consistent with obtaining a stable system. Moreover, activated sludge units that utlize only soluble contaminants can be operated at very high sludge ages, thus permitting much higher biological cell inventories which in turn increases stability, capacity, and purification while minimizing the generation of excess biological cells. (See also W77-00766; W76-12667) (Kreager-FIRL)
W79-01759

HOW TO CONDUCT A WASTEWATER SURVEY: PART II - DEVELOPING WASTE STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramus, NJ.
For primary bibliographic entry see Field 5G.
W79-01760

BIODEGRADATION OF PHENOLIC WASTE LIQUORS IN STIRRED-TANK, PACKED-BED, AND FLUIDIZED-BED BIOREACTORS,
Oak Ridge National Lab., TN.
D. W. Holladay, C. W. Hancher, C. D. Scott, and D. D. Chilcote.
Journal Water Pollution Control Federation, Vol. 50, No. 11, p 2573-2589, November, 1978. 6 fig, 8 tab, 19 ref.

Descriptors: *Biodegradation, *Phenols, *Chemical wastes, *Biological treatment, *Industrial wastes, *Packed beds, Filters, Pilot plants, Microorganisms, Coals, Waste water treatment.

A continuously-stirred tank bioreactor (CTSBR), a three-phase (air, liquid, and bacteria-coated media) packed-bed bioreactor (PBBR), and a three-phase, fluidized bed bioreactor (FBBR) were tested for the biodegradation of phenolic waste liquors from coal processing. The phenol degradation rates achieved by the three reactors were quantified according to a formula incorporating the volumetric flow rate, the feed and effluent phenol concentrations, and the effective reactor volume. The maximum phenol degradation rates achieved at a feed concentration of 500 mg phenol/liter and 0.99 conversion were 1.0, 4.7, and 8.5 g phenol/day/liter of bioreactor volume for the CSTBR, PBBR, and FBBR, respectively. Normal effluent phenol concentrations at maximum conversion were 0.25-1.00, 0.25-1.00, and 0.01-0.50 mg/liter for CSTBR, PBBR, and FBBR operation, respectively. Preliminary results indicated that the FBBR would also be effective in oxidizing thiocyanates at lower flow rates than the maximum rates attainable for effective phenol degradation. (Schulz-FIRL)
W79-01762

REFINERY CYANIDES: A REGULATORY DILEMMA,
Air Products and Chemicals, Inc., Allentown, PA.
R. G. Kunz, J. P. Casey, and J. E. Huff.
Hydrocarbon Processing, Vol 57, No 10, Section 1, p 98-106, October, 1978. 4 fig, 2 tab, 101 ref.

Descriptors: *Nitrogen compounds, *Oil industry, *Analytical techniques, *Industrial wastes, Toxicity, Oil wastes, Chemical wastes, Iron compounds, Corrosion, Waste water treatment.

Cyanides in petroleum refinery effluent can be in free, simple, or complexed forms which vary in toxicity to aquatic life. Simple cyanides may form complexes with metals in petroleum waste water and induce corrosion in coolers, condenser shells, and strippers; polysulfides have been used to inhibit corrosion in some catalytic cracking systems. Research on analytical techniques for cyanides in refinery effluents has focused on devising methods to differentiate between simple and complexed cyanides and to eliminate interference by thiocyanate with cyanide concentrations below 1 mg/liter; the modified Roberts/Jackson method to measure small amounts of cyanide in the presence of ferrocyanide is described. Methods which have been used to remove cyanides from refinery effluents include chemical oxidation, biological treatment, adsorption and catalytic oxidation, and precipitation. (Schultz-FIRL)
W79-01763

STATE OF THE ART REPORT ON PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5E.
W79-01764

THE REMOVAL OF ARSENIC(V) FROM ACIDIC SOLUTIONS,
Waste Research Univ, Oxon (England). Harwell Lab.
C. J. Jones, B. C. Hudson, and P. J. McGugan.
Journal of Hazardous Materials, Vol. 2, No. 4, 333-345, 1977/1978. 9 fig, 4 tab, 2 ref.

Descriptors: *Arsenic, *Metals, *Chemical precipitation, *Lime, *Iron compounds, Magnesium hydroxide, Dolomite, Leaching, Heavy metals, Industrial wastes, Sludge disposal, Waste water treatment.

Treatment with iron salts and alkaline earth me compounds has been used for effluents from el trolytic copper reclamation. Experiments to est lish the treatment efficiency for these effluer employed model solutions of As2O5 in 1.5 H2SO4 solutions which were treated with vari combinations of ferric sulfate, ferrous sulfate, lir magnesium hydroxide, and dolomite. Followi treatment, the solids were removed by centrifu tion and the supernatant was analyzed arsenic(V). Triangular diagrams outlined compo tion ranges for the treated liquors of 0.2-1.2 arsenic, 1.0-4.0% iron, and 3.0-6.5% alkaline ea metal. Treatment with ferrous sulfate plus lime v the most effective configuration, achieving 99.9 arsenic removal and residual concentrations about 5 ppm. Treatment with ferric sulfate p lime was less effective than with ferric sulfi lime, and magnesium hydroxide. The optimum p ticle size range for lime in ferrous-lime treatm was determined to be 50-100 microns. Ferric fate plus dolomite was fairly ineffective in rem ing arsenic from the solutions studied. Leach tests on arsenic-bearing sludge from the ferr sulfate-lime process in sand, clay, and chalk disp sions demonstrated that arsenic levels in leachi would be less than 1.0 ppm and generally less t 0.05 ppm; this suggested that the arsenic-bear sludges would be suitable for land disposal with posing a hazard to drinking water suppl (Schulz-FIRL)
W79-01765

RECOVERING SYSTEM FOR CHROME-PL ING WASTEWATER CONTAINING CHRON ACID (KUROMU MEKKI HAISUI NO SH SHISUTEMU),
T. Uratsuji, and H. Yoshida.
Mitsubishi Juko Giho (Mitsubishi Heavy Me Industries Technical Review), Vol. 15, No. 508-511, 1978. 4 fig, 4 tab, 2 ref.

Descriptors: *Chromium, *Metals, *Recycl *Ion exchange, *Chemical precipitation, wastes, Evaporation, Electrolysis, Indus wastes, Waste water treatment.

A chromic acid recovery system for electropla lines has been designed to employ three treatr processes with the selection dependent upon chromate concentration and source of the w solution. Electrolysis is used to purify waste tions from chrome plating and peeling baths w contain 150-300 g/liter chromate. Vacuum con sation is used to concentrate rinse waters init containing 50-200 ppm chromate; more dilute waters containing only 5-50 ppm chromate treated in an ion exchange column. The proce reported to be capable of recovering 63% o chromic acid and 90% of rinse waters. Chr acid solutions which can not be recovered treated by reaction with ferrite before dischr (Schulz-FIRL)
W79-01767

USE OF CONTINUOUS ION EXCHANGE REMOVAL OF ENVIRONMENTAL C TAMINANTS FROM WASTE STREAMS,
Bradford Univ., (England), School of Chem Engineering.
M. J. Slater, B. H. Lucas, and G. M. Ritcey.
CIM Bulletin, Vol. 71, No. 796, p 117-123, Au 1978. 8 fig, 6 tab, 11 ref, 1 append.

Descriptors: *Ion exchange, *Acid mine w *Resins, *Separation techniques, *Heavy m Copper, Iron, Nickel, Sodium, Cobalt, Mine d age, Acidity, Voids, Mass transfer, Mine wa Waste water treatment, Industrial wastes.

tic and continuous flow tests in a tapered, fluid-ed-bed ion-exchange column defined the optim conditions for removal of heavy metals, espelly copper, from acid mine water. The pilot nt included: a 96-inch column with a 6-inch are base and an 8-inch square flared top, fed h a strong acid resin, Amberlite 200 C in the lium form; a 60-inch regeneration column, fed h a saturated NaCl solution; and a wash umn. A synthetic sulfate mine water used in the ts contained 56 ppm Cu, 3.5 ppm Ni, 0.3 ppm , 1 ppm Fe, and 20 ppm Ca, at 4.0. Static tests re performed to obtain breakthrough curves, icating that a copper loading of 0.030 g of Cu/ of wet settled resin was accommodated. Voiges were varied over 0.50-0.80 and expanded heights of 134-215 cm were tested. A voidage 0.7 and a bed height of roughly 214 cm were cted for continuous flow tests at a liquid velocof 1.22 cm/sec; NaCl loss from the 24-inch h column was reduced by doubling the column gth. The fluidized-bed extraction reduced efflumetal concentrations to <0.02 ppm Cu, <0.03 n Ni, <0.04 ppm Co, <0.03 ppm Fe, and .04 ppm Ca. Three column configurations were eloped for treating 650 Imperial gal/min of e water with a waste strength similar to that of synthetic solution. (Lisk-FIRL)
9-01768

MOVAL OF COLOR FROM CARBONATE LPING EFFLUENT THE CALCIUM-MAGSIUM COAGULATION PROCESS,
itute of Paper Chemistry, Appleton, WI.
. Lathia, and T. W. Joyce.
pi, Vol. 61, No. 10, p 67-70, October, 1978. 4 4 tab, 11 ref.

criptors: *Pulp wastes, *Color, *Coagulation, emical precipitation, *Industrial wastes, Lime, gnesium, Hydrogen ion concentration, Separa- techniques, Sludge disposal, Chemical reacs, Waste water treatment.

increased use of sulfurless 'carbonte' pulping nany neutral sulfite semichemical (NSSC) mills vided the impetus for experiments to remove at 90% of the color from a whole-mill effluent oagulation with minimum quantities of calcium magnesium salts. Jar tests demonstrated that ppm dosages of calcium or magnesium ion at a of 12 would provide the desired degree of r removal. A regression equation was devel- from the experimental data to predict the ent color removal at any given salt dosage and Comparison of infrared spectra for NSSC and onate effluents indicated that the NSSC efflucontained significant amounts of carbonate, te, Tiosulfate, lignin, lignosulfate, and carboxgroups; the carbonate effluent contained only ficant amounts of carbonte and was predomid by aromatic nuclei rather than carboxylic ps. Chemical precipitation was cited as the r mechanism of color removal by the limenesium coagulation process. The process was rently reversible as the resulting sludge would ssolve and color return to the effluent when pH was lowered to about 7.6; this phenomenon to a recommendation that the raw sludge be erated before disposal. (Schulz-FIRL)
-01769

ICITY REMOVED BY FOAM SEPARAN,
sh Columbia Research Council, Vancouver.
of Applied Biology.
Ng, L. A. Gutierrez, and J. C. Mueller.
strial Wastes, Vol. 24, No. 5, p 36-38, 40-41, 5 fig, 3 tab, 12 ref.

criptors: *Aeration, Toxicity, *Foam separa- *Pulp wastes, *Pulp and paper industry, ching wastes, Pilot plants, Chemical wastes, ration techniques, Turbines, Bubbles, Industrastes, Waste water treatment.

studies at two bleached draft mills in Canada ated foam separation as a means of reducing oxicity of kraft mill effluents. The 100,000 gpd plant employed jet aerators for foam generation, turbines for foam breaking, and a pH control system. Jet aerator performance was evaluated in terms of the effect of jet air load, influent characteristics, retention time, ease of installation and operation, dependibility, and bubble consistency. The turbine foam braker was evaluated in terms of capacity, reliability, and power consumption. Influents from the two kraft mills had toxicity ranges of 6-23 and 1.1-8 hrs (median survival time of fish). Critical gas interfacial areas for detoxification of the two effluents were 5.3-7.8 and 40 sq m/liter at success rates of 89 and 84%, respectively. The jet aerator produced mean bubble sizes of .015 and 1.2 mm at air loads of 0.03 and 0.6 cu m/min, respectively. The three-blade vaned disc turbine was capable of collpsing 1.4 cu m foam/min. (Schulz-FIRL)
W79-01770

REMOVING TOXICITY IN AN AERATED STABILIZATION BASIN,
British Columbia Forest Products LTD., Mackenzie.
K. Chandrasekaran, R. Reis, G. Tanner, and H. Rogers.
Pulp & Paper Canada, Vol. 79, No. 10, p 65-68, 70, 72, October, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: Toxicity, *Aeration, *Oxidation lagoons, *Biological treatment, *Pulp wastes, Pulp and paper industry, Biochemical oxygen demand, Resins, Industrial wastes, Lethal limit, Bioassay, Waste water treatment.

the British Columbia Forest Products Ltd. mill in Mackenzie combines maximum in-plant containment with biological treatment in a 4.7-day aeration lagoon which has achieved average BOD reductions of 88%. A study was conducted over a 28-day period to monotor the toxicity of clarifier inlet, outlet, and aeration lagoon outlet waste water in terms of median fish mortality (LC50), a tocicity emission rate (TER), and toxicity emission index (TEI). The aerated stabilization basin achieved average removal rates of 68% BOD, 90% toxicity, and 96% total resin acids over the study period. The 96hr-LC50 values were 100% or greater for 24 tests. More toxic levels of 77 and 98% for the remaining two samples were attributed to black liquor losses. Resin acids detected at the clarifier outlet included 13.9% pimaric, 20.8% isopimaric, and 65.2% abietic plus dehydroabietic; dehydroabietic acid dominated the stabilization lagoon effluent. The resin content of foam from the lagoon was highly variable. The highest concentrations of resin acids in foam and sludge were in samples collected at a quiescent zone near the lagoon outfall. Unbleached whitewater was the largest contributor to the total untreated toxicity at the Mackenzie mill. (Schulz-FIRL)
W79-01772

STATUS OF THE CLOSED-CYCLE CONCEPT KRAFT MILL AT GREAT LAKES PAPER CO.,
Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
For primary bibliographic entry see Field 3E.
W79-01773

COLOR REMOVAL FROM TEXTILE DYE WASTE USING MAGNESIUM CARBONATE,
Auburn Univ., AL. Dept. of Civil Engineering.
J. F. Judkins, and J. S. Hornsby.
Journal Water Pollution Control Federation, Vol. 50, No. 11, p 2446-2456, November, 1978. 8 fig, 2 tab, 5 ref.

Descriptors: *Textiles, Coagulation, *Dyes, *Magnesium carbonate, *Industrial wastes, *Color, Lime, Chemical wastes, Separation techniques, Recycling, Magnesium compounds, Waste water treatment, Effluents, Hydrogen ion concentration.

Jar tests were performed to evaluate coagulation with magnesium carbonate and/or lime for the treatment of textile waste. The experiments utilized seven different dye wastes, including four prepared with synthetic dyestuffs (vatblue 6, vat yellow 22, Levco sulfur blue 7, and disperse blue 7, and disperse blue 3) and three collected from the washboxes on the dye range at a textile mill (vat waste, sulfur dye waste, and a mixture of sulfur and idspersed waste). The magnesium carbonate/lime treatment was vry effective for decoloration of vat wastes and less effective with dispersed dyes; treatment with 50 mg/liter MgCO3 and 330 mg/liter Ca(OH)2 removed 91, 100, and 54% of the color from the synthetic vat, sulfur, and dispersed dye wastes, respectiely. Magnesium recoveries of 87-97% were achieved in studies evaluating the feasibility of recovery following coagulation of synthetic blue vat dye wastes. The high natural pH of the actual textile mill vat wastes (10.0-12.0) made them especially amenable to the combined magnesium carbonate/lime treatment. The combined treatment was more effective than treatment with either lime or magnesium carbonate for all three actual waste streams, although high dosages were required for the sulfur-dispersed waste. (Schulz-FIRL)
W79-01776

RATIONALIZATION AND ENVIRONMENTAL PROBLEMS OF BEAMHOUSE OPERATIONS,
E. F. Miller.
The Leather Manufacturer, Vol. 95, No. 10, p 12, 15-18, 30-33, 20-28, October, 1978. 8 fig, 53 ref.

Descriptors: *Tannery wastes, *Chromium, *Recycling, *Water consumption(Except consumptive use), *Industrial water, Water reuse, Pollutant identification, Proteins, Heavy metals, Effluents, Industrial wastes, Waste water treatment.

Beamhouse operations are discussed with respect to the minimum quantity of water required for leather production and methods of reducing effluent pollutants without impairing the leather quality. Presoaking, soaking/liming, deliming/bating, washing, pickling/tannage, and cleaning are reported to require 2-3, 1-2, 1-2, 1-2, 0.5-1, and 1-2 liters water/kg salted hide or a total of 8.5-15 liters/kg raw hide. Of the tanning waste streams, liming liquor is cited as the strongest source of pollution from the tannery because of its high levels of suspended solids and protein. Pilot studies in several countries have demonstrated that liming liquors may be reused 15-20 times. Protein may be removed from liming liquor by lowering the pH to the isoelectric point of the protein components or by precipitation in an alkaline medium. Methods to improve the quality of effluents from pickling and tannage include precipitation of the chrome tanning agent in the residual liquors, direct reuse, process optimization, and partial replacement of the chrome tanning agent by other materials. (Schulz-FIRL)
W79-01778

LEATHER TANNING INDUSTRY-SLUDGE PROBLEMS AHEAD,
For primary bibliographic entry see Field 5E.
W79-01779

THE EVOLUTION OF TANNERY EFFLUENT TREATMENT--GUIDELINES FOR FURTHER INVESTIGATIONS,
S. G. Shuttleworth.
Journal of the Society of Leather Technologists and Chemists, Vol. 62, No. 4, p 87-94, July-August, 1978. 2 fig, 4 tab, 87 ref.

Descriptors: *Tannery wastes, *Biological treatment, *Activated sludge, *Oxidation, Sulfur compounds, Industrial wastes, Pilot plants, Aeration, Return flow, Coagulation, Sludge treatment, Sludge disposal, Trickling filters, Waste water treatment.

Pilot studies on and the development of methods to treat tannery wastes are reviewed extensively. Lagoons have been used to reduce the BOD of tannery effluent as well as to store treated effluent during periods of low river flow or inclement weather. Spray irrigation of grasslands has been practiced successfully for 60 yrs in South Africa. The increased incidence of municipalities having to treat combined domestic/industrial waste streams

has given rise to the development of tannery waste pretreatment and disposal standards. Flue gas and surface aeration have been employed to control the pH of beamhouse liquors. Manganese-catalyzed oxidation, iron salt additions, activated sludge, and acid/alkali processes have been used for sulfide liquors; low sulfide, enzyme, and other sulfide-free processes have been tested as pollution-reducing alternatives to conventional high sulfide unhairing. Equipment modifications have allowed reductions in the quantity of lime required in tanning. Trickling filters, high-rate biofilters, oxidation ditch systems, extended aeration, and the activated sludge process have been employed to biologically treat tannery wastes; physicochemical treatment has generally incorporated additions of iron salts or alum. Pilot studies at a fellmongery and a tannery in South Africa have tested the activated sludge process for the treatment of segregated beamhouse waste and tan liquors. Recommendations are made for further studies to optimize the activated sludge process for tannery wastes and for sludge handling practices. (Schulz-FIRL)
W79-01780

REPORT OF WASTE SOURCE INVENTORY AND EVALUATION, DADE COUNTY, FLORIDA.
Environmental Protection Agency, Athens, GA. Southeast Water Lab.
For primary bibliographic entry see Field 5G.
W79-01834

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
May 22, 1972, Vol. II, 551 p.

Descriptors: *Effluents, *Water quality, *Wastewater treatment, *Public health, *Florida, Public rights, Sewage treatment, Municipal wastes, *West Palm Beach(FL), *Palm Beach County(FL), *Environmental impacts, Public attitudes, Public values, Public participation, EIS review process, Sewage treatment plants.

This is an extensive transcript of a public hearing conducted May 22, 1972 concerning proposed sewage treatment plants in West Palm Beach, Florida. It is the second of two volumes of evidence presented at the public hearing to the regional EPA and includes comments of many people concerned with the environmental consequences of building wastewater treatment plants. Briefly, the town of West Palm Beach started construction on a modern secondary treatment plant which discharged through an outfall into the influence of the Gulf Stream. Construction was halted in 1971 until a final EIS statement was prepared. This volume is useful in helping the regional EPA judge the merits of the wastewater treatment project and the possibilities of providing alternate plans for treating and disposing of municipal wastes. The text provides testimony from expert witnesses on the merits of secondary and tertiary wastewater treatment processes and the subsequent disposal problem of effluents. The public hearing also covering the environmental impact of the proposed project, including the air, land and noise impacts on the recreational areas and historical sites nearby. Public attitudes about the project were recorded. (Coan-NC)
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
May 22, 1972, Vol. 1.

Descriptors: *Waste water treatment, *Sewage disposal, Primary treatment, Secondary treatment, Tertiary treatment, Sewage treatment, Municipal wastes, *Water quality, *Water pollution control, *Wastewater management, Public water supply, Public health, Biochemical oxygen demand, Public rights, Florida, *Palm Beach County(FL), *Environmental impacts, EIS review process, *West Palm Beach(FL), *Public participation, Public values.

This report is a compilation of documents presented at a public hearing on May 22, 1972 at the County Commission Chambers in the Palm Beach County Courthouse, West Palm Beach, Florida. All documents were presented to the regional EPA concerning the environmental impacts of the proposed sewage disposal plants in West Palm Beach. These facilities originally included a proposal for tertiary treatment by the use of polishing ponds and discharge into the ship's channel of Lake Worth and an alternate plan to have a modern seconary treatment plant with discharge through an outfall into the influence of the Gulf Stream. The alternate plan was approved by the necessary agencies, financial arrangements were made, and some construction was begun. In 1971, all construction was stopped until a final EIS was produced. This report aids EPA's EIS reviews process by presenting all sides in the controversy surrounding the construction of the treatment facilities. Governmental agencies submitted reports, consulting firms conducted studies and submitted their findings, area specialists were contacted and their advice is recorded. The document lists testimony by area of public interest groups and city and county officials, newspaper stories covering the debates, attorney's briefs on the relevant legal issues, and all other relevant papers submitted to the EPA concerning the treatment facilities. (Coan-NC)
W79-01840

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 4,104,160, 9 p, 11 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water purification, *Water pollution treatment, Color, Separation techniques, Cellulose, Absorption, Chemical precipitation, Filtration, Paper and pulp industry, Dyes.

A process for the purification of industrial effluents, especially for the decolourisation of waste liquors arising in the textile, paper and leather industry is described where the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. Preferably, filters of cellulose itself or of waste sheets from printing are used. Three processes are suitable for this purpose: the so-called stirring process where the water to be purified is stirred with the pretreated cellulose material in a vessel and the cellulose material and water are then separated; the so-called flow bed process in which the pretreated cellulose material is kept in the suspended state by the counter-current flow of the liquor to be purified; and the so-called filtration process where the liquor to be purified is passed through pre-treated cellulose filter material. Of these three process variants, the filtration process is preferable. (Sinha-OEIS)
W79-01874

METHOD FOR TREATING AQUEOUS WASTES CONTAINING AT LEAST 1% PROTEINACEOUS MATTER,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
G. M. Wein.
U.S. Patent No. 4,104,161, 4 p, 2 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Organic wastes, Separation techniques, Coagulation, *Proteins, Chemical reactions, Rendering plant wastes.

A method is described for treating aqueous wastes containing at least 1% proteinaceous matter with at least 0.20% by weight of cationic water-solub polyamines. Preferred polyamines include ethyle dichloride-ammonia, quaternary ethylene dichl ride-ammonia and dimethylamine-epichlorohydr ammonia polymer. The invention is useful in tre ing rendering plant effluents as well as in treati effluents containing blood and blood seru (Sinha-OEIS)
W79-01875

PROCESS FOR DETOXIFICATION OF FO MALDEHYDE CONTAINING WAS WATERS,
Deutsche Gold- und Silber- Scheideanstalt A. Frankfurtam-Main (West Germany).
H. Junkermann, and H. Schwab.
U.S. Patent No. 4,104,162, 6 p, 6 tab, 2 ref; Offic Gazette of the United States Patent Office, V 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatme *Industrial wastes, *Water pollution treatme Toxicity, Chemical reactions, *Formaldehyde, H drogen peroxide.

Formaldehyde containing waste water is detoxif by treating the waste water with hydrogen per ide in the presence of alkali at an initial tempe ture of 10-35C. In an alternative and prefer form of the invention the waste water is heated a temperature of at least 50C and then 10-35% the hydrogen peroxide equivalent to the formal hyde is added. (Sinha-OEIS)
W79-01876

DEVICE FOR TREATING WASTE WATER,
R. G. Chelton.
U.S. Patent No. 4,104,164, 5 p, 2 fig, 9 ref; Offi Gazette of the United States Patent Office, 973, No 1, p 277, August 1, 1978.

Descriptors: *Patents, *Waste water treatm *Water pollution treatment, *Water reuse, W utilization, Separation techniques, Filtration, claimed water, Impaired water use, Water con vation, Equipment, Cleaning industries, Proc recovery.

A process for continuously treating waste w from laundries, car washes and like cleaning es lishments to recover water soap, detergents, other chemilaks is carried out by flowing the treated water through sand chambers to rem heavy sediment, collecting the water in a sto compartment, pumping the water through a ce fugal separator for removal of large particu matter and then through a filter containing m for removal of flocculated soaps, deterg waxes, and other particulate matter, thence in filtered water storage compartment. The wat pumped from the filtered water storage comp ment. The water is pumped from the filtered w storage compartment by a pressure pump. Pa the water containing unused soaps, deterg conditioning agents, and other chemicals i turned from the filtered water storage com ment for reuse, the other parts enters a filter taining absorptive media for removal of the maining soaps, detergents, conditioning agents ganic compounds and other chemicals. Backw water from the filters is returned through a r rate bag filter recovering the water and lea behind solids in the bag for removal and disposal. (Sinha-OEIS)
W79-01877

APPARATUS FOR PURIFYING WA WATERS,
F. Besik.
U.S. Patent No. 4,104,167, 12 p, 5 fig, 2 tab, 1 Official Gazette of the United States Patent O Vol 973, No 1, p 278, August 1, 1978.

Descriptors: *Patents, *Waste water treat *Sewage treatment, *Industrial wastes, *Biolo treatment, Water pollution treatment, Water ity control, Chemical reactions, Activated slu Chemical precipitation, Flocculation, Equipr

An apparatus in which contaminants from the raw r waste waters are removed by combined biologi-al-chemical degradation comprises first, second nd third chambers. An aeration zone is provided the first chamber. A slanted plate is located in ne second chamber to define an aeration zone vhich overlies a sludge separation zone. Means for ransfering such waters from the equalization zone o the upper region of the aeration zone is pro-ided. The slanted plate provides for a downflow f waters through the aeration zone and an upflow f waters through the sludge separation zone, vhere due to the lower end of the slanted plate eing spaced from the lower portion of the second hamber wall forms a constriction to the flow of udge separation zone. The height of the sludge eparation zone is sufficient to dampen the upward ow of the waters to develop a quiescent region in ne upper portion of the sludge separation zone. leans for dispersing air into the active media vhich is circulated through the upward flow chan-el is provided. The third chamber has clarifying one. (Sinha-OEIS)
779-01880

LUDGE SETTLING AND DE-WATERING AP-ARATUS,
G. Kiss.
.S. Patent No. 4,104,168, 6 p, 5 fig, 11 ref; Official azette of the United States Patent Office, Vol 73, No 1, p 278, August 1, 1978.

escriptors: *Patents, *Waste water treatment, Water pollution treatment, Sludge disposal, Vater purification, Oily water, Separation tech-ques, Settling basin, Gravity, Waste disposal, uspended solids, Industrial wastes, Dredge spoil.

nprovements in sludge settling and de-watering paratus or sludge consolidator means include eans to remove oil, fat solids and other lighter an water substances as well as heavier than water bstance from residue water. The sludge is proc-sed by vibratory means aided by gravity that is fective to insure that all substances heavier than ater are carried by gravity to the bottom of the ater mass for discharge. Generally, the sludge nsolidator includes a vertically arranged cylin-r or tank which comprises three divisions or mpartment arranged one above the other. In peration, sludge is collected in and clear water scharged from a middle compartment; heavy lids settling out of the water are collected in the ttom compartment. The upper compartment col-cts suspended substances that are lighter than ater and discharges them through a valved outlet the upper end. Clear water remaining is filtered d then discharged at a level above the sludge vel. (Sinha-OEIS)
779-01881

ROCESS FOR REMOVING CYANIDE-CON-AINING COMPONENTS FROM AQUEOUS EDIA,
readwell Corp., New York. (Assignee).
Muller, and J. M. Schreiner.
S. Patent No. 4,105,545, 5 p, 2 tab, 5 ref; Official azette of the United States Patent Office, Vol 3, No 2, p 735-736, August 8, 1978.

escriptors: *Patents, *Waste water treatment, ndustrial wastes, *Water pollution treatment, eparation techniques, Ammonia, Bubbles, zone, Adsorption, Oxidation, *Cyanides, Adsub-e separation, Steel industry.

method for treating cyanide laden waste water luents derived from coke-oven operations, blast rnace blowdown and other industrial wastewater described. The process for removing cyanide-ntaining components from aqueous media, par-ularly weak ammonia liquors comprises: con-cting the media with bubbles in the presence of a llector to remove a substantial amount of com-exed and simple cyanide; and contacting the edia with ozone to substantially remove the re-aining cyanides. This method is a combination of adsorptive bubble separation commonly called lsubble separation' followed by an ozone oxida-n treatment. (Sinha-OEIS)
W79-01884

METHOD AND APPARATUS FOR PURIFICATION OF WATER,
Ebara Infilco Kabushkik Kaisha, Tokyo (Japan). (Assignee).
Y. Kakumoto, M. Kanegawa, T. Iwaizumi, and N. Matsumoto.
U.S. Patent No. 4,105,549, 15 p, 15 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 736-37, August 8, 1978.

Descriptors: *Patents, *Water treatment, *Waste water treatment, *Water purification, Water pollution treatment, Separation techniques, *Activated carbon, Adsorption, Water quality control, Carbon slurry, Packed bed.

Water or waste water is purified by passing it through a packed bed of active carbon. The apparatus comprises a tank having a packed bed formed of active carbon including in the upper portion of the tank at least one tube for flowing in a fluid to be treated into the tank and at last one tube for flowing an active carbon slurry out of the tank. In the lower portion of the tank at least one tube is provided for flowing the treated fluid out of the tank and at least one tube for flowing an active carbon slurry into the tank. In the course of the adsorption treatment the fluid to be treated is passed through the active carbon bed downwardly. During replenishment of the bed, regenerated or fresh active carbon is introduced under pressure into the lower portion of the active carbon bed as a slurry and used active carbon present in the upper portion of the active carbon layer is discharged as a slurry together with solids and colloidal material. (Sinha-OEIS)
W79-01886

OIL-CONTAINING EFFLUENT TREATMENT BY GRAVITY SEPARATION,
British Petroleum Co. Ltd., London (England). (Assignee).
G. F. Oldham.
U.S. Patent No. 4,105,553, 5 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 738, August 8, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil wastes, *Separation techniques, Water pollution treatment, Filtration, Heating, Graity separation, Oil recovery.

Oil-containing effluent such as refinery or other industrial plant effluent is treated by passing it through a gravity separator and obtaining (1) a wet oil fraction, (2) an aqueous fraction of reduced oil content, and (3) a wet oily sludge. Fractions (1) and (3) are then combined and passed through a pressure filter so that solids are retained and oil and water passed through. The oil and water are then passed to a separator and a reusable oil fraction is recovered and the water fraction is returned to the gravity separator. Fraction (3) requires to be heated to permit the water, oil and solids to separate. (Sinha-OEIS)
W79-01888

LIQUID WASTE PROCESSING SYSTEM,
Combustion Engineering, Inc., Windsor, CT. (Assignee).
E. R. D'Amaddio, and D. N. Enegess.
U.S. Patent No. 4,105,556, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 739, August 8, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Industrial wastes, *Radioactive wastes, Water pollution treatment, Separation techniques, Water quality control, *Filtration, *Reverse osmosis, *Evaporation, Ion exchange, Water reuse, Evaporators.

The liquid waste processing system first chemically treates the waste liquid, second filters out the solid particles of waste liquid in a back-flushable filter, third processes the wastes by a reverse osmosis module, and finallly concentrates the concentrate in a thin-film evaporator. After an appropriate degree of chemical pretreatment, the liquid waste is pumped from the holding tank through a filter which removes a large fraction of the particulate and precipitated solids. The waste liquid is then treated by a reverse osmosis module which results in an extremely pure permeate and concentrate containing the undesirable elements. This concentrate is next passed to a thin-film evaporator which further concentrates the concentrate. The distillate from the thin-film evaporator is recycled to the inlet of the reverse osmosis module while the concentrate is discharged to the solid waste processing system. The permeate from the reverse osmosis module may be further purified by an ion exchanger and either discharged to the environment or recycled into the system as a relatively pure and useful liquid. (Sinha-OEIS)
W79-01890

INTERACTION OF CHLORINE AND ORGANIC MOLECULES--EFFECTS OF INORGANICS,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
For primary bibliographic entry see Field 5B.
W79-01903

WATER REUSE HIGHLIGHTS, A SUMMARY VOLUME OF WASTEWATER RECLAMATION AND REUSE INFORMATION,
American Water Works Association Research Foundation, Denver, CO.
R. D. Heaton, and E. Rehfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 386, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, January 1978. 119 p, 23 fig, 15 tab. OWRT T-0058(7709).

Descriptors: *Water reuse, *Waste water treatment, *Reviews, *Technology transfer, Information exchange, Municipal wastes, *Tertiary treatment, Public health, Legislation, Planning, Water treatment, Water pollution treatment.

This is a comprehensive summary of municipal wastewater reclamation and reuse information gathered by the AWWA Research Foundation. It provided the basis for an ongoing monthly newsletter 'Municipal Wastewater Reuse News'. The volume is separated into the categories of advanced wastewater treatment (AWT), related conferences, health effects research, legislative and funding activities, modeling, position statements, published literature, regulations, water reuse plans and demonstrations.
W79-01978

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. A. Johnson, and L. D. Dreyer.
Alaska Department of Natural Resources Report, June 1977. 115 p, 17 fig, 2 append.

Descriptors: *Planning, *North Slope Borough(AK), *Water utilization, *Water supply, *Waste water treatment, *Sewage treatment, Regional analysis, Regional development, *Alaska, Bibliographies, Potable water, Alternative planning, Land use, Arctic, Cold regions, Biological treatment, Anaktuvuk Pass(AK), Atkasook(AK), Barrow(AK), Kaktovid(AK), Nuiqsut(AK), Point Hope(AK), Point Lay(AK), Wainwright(AK).

Water use in the eight villages of Alaska's North Slope Borough is examined to assist in evaluating and planning for present and future water use, treatment, and disposal requirements. Information on location, physical setting, and land use are summarized for Anaktuvuk Pass, Atkasook, Barrow, Kaktovid, Nuiqsut, Point Hope, Point Lay, and Wainwright. An extensive bibliography is appended, and there are sections on alternative technologies in arctic water supply and wastewater treatment, and on foreseeable developments affecting water and land use allocations. About half of rural Alaskan villages need immediate improvement in domestic water supplies and face serious problems of contamination of natural waters with

untreated sewage. Many Alaskan waters are high in iron and manganese, and removal is expensive; however, these metals constitute an aesthetic rather than a health problem. Advanced processes are required to treat brackish and saline waters. For wastewater purification, physical-chemical operations are not normally used in cold regions, but a variety of biological treatment processes are suitable. Septic tanks and faculative lagoons usually must be heated. Important future development in the region include a shift in major construction activity to the Brooks Range foothills and Point Lay coastal plain with intensive oil and gas exploration, and possible coal development near Atkasook. (Lynch-Wisconsin)
W79-01991

5E. Ultimate Disposal Of Wastes

STATE-OF-THE-ART APPLICABILITY OF CONVENTIONAL DENSIFICATION TECHNIQUES TO INCREASE DISPOSAL AREA STORAGE CAPACITY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W79-01520

FUNGAL DEGRADATION OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE,
Auburn Univ., AL.
W. M. Hagler, Jr., N. D. Davis, and U. L. Diener.
Mycopathologia, Vol. 58, No. 3, page 177-181, 1976. OWRT A-030-ALA(2).

Descriptors: *Sludge degradation, *Sewage sludge, *Anaerobic digestion, *Fungal degradation, Biodegradation, Humus, Sludge disposal, Waste disposal, Cunninghamella elegans, Rhizopus oligosporus, Myrothecium verrycaria.

Sewage sludge is a stable humic material that breaks down slowly with time when mixed with soil. The disposal of sewage sludge is one of the problems of environmental pollution throughout the world. Approximately 455,000 cubic meters of sewage sludge are produced daily in the United States (7). The development of supplementary methods of sewage treatment to be used in tandem with anaerobic digestors are of current interest. Benefits of such a tandem system utilizing fungi would be the acceleration of recycling of waste, supplemental detoxification of sludge, and perhaps even recovery of utilizable protein. The use of fungi to accelerate sludge degradation with the possible side benefits of production of protein or other recoverable metabolites has not been investigated. This paper reports the screening of fifty fungi for their ability to grow on and degrade anaerobically digested sewage sludge and the determination of the level of protein produced by C. elegans on this medium.
W79-01547

MYCOFLORA OF ACTIVATED SEWAGE SLUDGE,
Auburn Univ., AL. Water Resources Research Inst.
U. L. Diener, G. Morgan-Jones, W. M. Hagler, and N. D. Davis.
Mycopathologia, Vol. 58, No. 2, p 115-116, 1976. OWRT A-030-ALA.

Descriptors: *Mycoflora, *Activated sludge, Serial dilution, Sewage sludge, Isolation, *Alabama, Auburn(Ala), *Anaerobically digested sludge, Pollutant identification, *Fungi.

Thirty-eight species of fungi were identified in pure culture after isolation from activated sewage sludge by serial dilution. Nine species and genera were identified that had not been previously reported. In 1963, Cooke (1) published an excellent laboratory guide on the identification of fungi from polluted water, sewage, and sewage treatment systems; of approximately 30 papers cited only one (2) dealt with fungi from activated sewage sludge. Later (1970), Cooke and Pipes (3) enumerated 47 fungi consisting of 4 genera of yeasts and 33 genera of filamentous fungi that had been isolated from activated sludge. This paper reports the mycoflora of anaerobically digested sludge from a residential area in Auburn, Alabama.
W79-01548

MOBILE CENTRIFUGAL UNIT FOR USE IN DEWATERING PAPER SLUDGES (DIE FAHRBARE ZENTRIFUGENANLAGE BEIM EINSATZ ZUR ENTWAESSERUNG VON PAPIERSCHLAEMMEN),
VEB Komplette Chemieanlagen, Dresden (East Germany).
K. Rodel, M. Marcz, A. Hilbert, and M. Bergmann.
Zellstoff und Papier, Vol. 27, No. 2, p 80-82, March-April, 1978. 4 fig, 3 illus.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, Sludge, Wastes, Industrial wastes, Laboratory equipment, Pulp wastes, Pulp and paper industry, Solid wastes, Foreign countries, Europe, East Germany.

Since 1976 a mobile laboratory equipped for cntrifuging and sludge dewatering has been used in East Germany for preliminary evaluation of papermill sludges before planning and constructing dewatering equipment. The unit and its use are described. (Ward-IPC)
W79-01606

IMPACT OF RESIDUAL BIOSOLIDS ON RECEIVING WATER QUALITY,
For primary bibliographic entry see Field 5C.
W79-01609

CHARACTERISTICS AND USE OF NONSETTEABLE SOLIDS BY AN AQUATIC FOOD CHAIN ORGANISM,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W79-01617

BIOLOGICAL IMPACT OF VARIOUS CHLORINATED PHENOLICS AND RELATED COMPOUNDS ON DAPHNIA MAGNA,
State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
For primary bibliographic entry see Field 5C.
W79-01618

APPLICATION OF GEOTECHNICAL THEORIES TO THE LANDFILL DISPOSAL OF PAPERMILL SLUDGES,
Maine Univ. at Orono. Dept. of Civil Engineering.
R. E. Wardwell, S. R. Cooper, and W. A. Charlie.
Presented at TAPPI Environmenta Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings, (TAPPI, Atlanta, Georgia 30338), p 193-206. 11 fig, 12 ref.

Descriptors: *Sludge disposal, *Landfills, *Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Solid wastes, Design, Operation and maintenance, Activated sludge, Sludge, Soil mechanics, Consolidation, Permeability, Field tests, Laboratory tests, Soil stability, Maine, Ultimate disposal, Disposal, Water pollution control.

Many of the environmental problems associated with the design and operation of sludge landfill disposal sites may be related to a lack of information about the geotechnical behavior of activated sludge. Basic soil mechanics theories of consolidation, shear strength, and permeability are presented along with their relationship to the performance of pulp and paper mill sludge. The results of laboratory tests and field observations are summarized and briefly discussed. The use of soil mechanics methods to consolidate the sludge and thus increase the stability of the deposit is illustrated at Boise Cascade Corp.'s landfill site located on the eastern slope of Farrington Mountain in Mexico, Maine. (Swichtenberg-IPC)
W79-01620

LIQUID MANURE AND ENVIRONMENT PROTECTION, (IN GERMAN),
A. Forster.
Landtechnik, Vol. 27, No. 8, p. 166-168, April, 1972. 5 fig.

Descriptors: *Liquid wastes, Odor, Regulation, Transportation, *Farm wastes, *Field spreading, Sweden, Switzerland.

A great number of farmers use liquid dung a manure on their fields because transportation cost for this method can be reduced by 30-40%. Severa European contries provide for special environmen protection measures to be applied in this case Similar to the regulations for the storing of oils an chemical agents, those for storing and utilizin liquid manure will depend on whether the drinkin water in the various regions is endangered by th liquid dung. In Sweden and Switzerland, storin liquid dung for 4-9 months is obligatory becaus after this time a great number of pathogenic micro organisms are destroyed and risk is considerabl reduced. Another reason is that during specia periods such as holidays or in high pressure area spraying liquid dung onto the fields is not allowe in order to prevent the formation of bad odor Large farms will have to provide for dung deodor ization in the future in order to avoid the presen disadvantages of dung utilization. Dung deodoriza tion can be effected mechanically, thermall chemically, or biologically; the latter seems to b the most perfect and economical method. The bio logical treatment can be effected in a cold, war or hot way, however, the cold method is the lea advantageous since the fertilizing value in its liqui phase is extremely low. Dung treated in th manner can be distributed by means of a sprayin device without causing difficulties, however, will be economical only for farms with an annua dung production of more than 8,000 cu m of liqui dung. Smaller farms should use the new glass-fib truck-mounted tanks of a volume of 8,000 liter (Solid Waste Information Retrieval System)
W79-01628

FIELDS OF USE AND APPLICATION O MANURE AND MANURE DISPOSAL, (I GERMAN),
V. G. Blanken.
Landtechnik, Vol. 25, No. 21, p. 674-676, Noven ber, 1970.

Descriptors: *Fertilizers, *Waste treatmen *Waste disposal, Incineration, Drying, Economic Groundwater, *Farm wastes, *Dumping, Lan spreading.

Manure can be used for fertilizing agricultur areas, it can be dumped, destroyed by chemica biologically decomposed or incinerated. Its use fertilizer is still the most economic method f disposal of manure, provided that there is agricu ture in the area. If not, one of the other metho must be selected. Drying has proved to be ec nomical only in the case of chicken manu Drying costs for the manure of about 40,000 chic ens run at DM 7.00. Conversion into humus justified only if there is a sufficiently large mark for the product. Costs are DM 10.75 for 8,0 chickens. In the absence of a market for manure, seems to be best to subject it to biological deco position. There is, however, the problem of dispo al of the residual matter. Incineration would be t best method from a sanitary point of view, but it too expensive. Dumping is too dangerous for t environment. Pollution of the environment larvae and worm eggs can be avoided, by stori the manure in large containers for long periods time. For protection of the groundwater sm amounts of manure ought to be spread over t fields at one time, and used on flat acres onl (Solid Waste Information Retrieval System)
W79-01633

UTILIZATION AND DISPOSAL OF LIQUID MANURE AT SMALL AVAILABLE SPACE, (IN GERMAN),
V. H. Traulsen.
Landtechnik, Vol 25, No. 21, p. 665-668, November, 1970. 7 fig, 7 ref.

Descriptors: *Liquid wastes, *Waste treatment, *Waste disposal, Economics, Odor, Groundwater pollution, Pathogens, Incineration, Drying, *Farm waste, Land spreading, Spraying, Composting, Oxidation tanks, Germany.

Of the manure disposal and utilization methods, spraying of liquid manure over crops is the least expensive one. Generally 40-60 cbm liquid manure can be applied per hectare and year. Some plats such as corn are able to consume up to 100 cbm per hectare and year, asparagus as much as 200 cbm. Pathogenic germs are not killed by this method. In the German Democratic Republic, it is required to store manure for 21 days before it is applied to the fields. Studies have shown that salmonellas survive almost one year in liquid manure. Other drawbacks of this method are that the manure cannot be applied to the fields at each season since it causes annoying odors and pollutes groundwater. Spreading over areas which are then withdrawn from agricultural use for one or more years bears the same disadvantages. Composting by mixing with lime, peat, and styropor has not been done yet with any manure other than chicken manure. Decomposing in lagoons does not kill all pathogenic germs either. Anaerobic decompostion is too expensive. Incineration is the most hygenic method but it involves high investment and operating costs. Composting and drying and oxidation tanks are the most economical methods available at the moment. (Solid Waste Information Retrieval System)
W79-01640

A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 5C.
W79-01643

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W79-01655

EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W79-01656

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; EVALUATIVE SUMMARY,
State Univ. of New York, Buffalo. Great Lakes Lab.
J. A. Sweeney.
Available from the National Technical Information Service, Springfield, VA 22161, as ADA-055 865 Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, June 1978. 125 p 6 tab, 19 fig, 46 ref.

Descriptors: *Aquatic environment, Environmental effects, *Lake Erie, *Dredged material disposal, *Waste disposal site, *Ashtabula River.

Evaluates impacts of the release of dredged material on chemical and physical aspects of the aquatic and benthic environments as well as phytoplankton, zooplankton, benthos, and fish in Lake Erie off Ashtabula, Ohio, from June 1975 through September 1976. Samples and measurements were taken prior to, during, and after the release of materials from a hopper dredge during August 1975 and May 1976. Impacts on the water column including the phytoplankton zooplankton communities were short lived. While the benthos as well as the chemical and physical nature of the sediments were altered, predisposal conditions generally were reestablished within a year after the release of the dredged material. Storm event related erosion of the dredged material appeared to be a major factor in the recovery of the area. There was no evidence of accelerated uptake of heavy metals by fish or benthos as a consequence of disposal. Harbor macroinvertebrates, transported with the dredged materials, did become established in the depositon area. With the exception of the latter, the obseved impacts were similar to those noted in studies to evaluate the impact of dredged materials on the marine environment. (WES)
W79-01657

USE OF DREDGED MATERIAL ISLANDS BY COLONICAL SEABIRDS AND WADING BIRDS IN NEW JERSEY,
Manomet Bird Observatory, MA.
F. G. Buckley, and C. A. McCaffrey.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-1, June 1978. 205 p, 4 append. 9 tab, 47 fig, 49 ref.

Descriptors: *Birds, *Shore birds, *Islands, *New Jersey, *Dredged material, *Colonial birds.

Use of dredged material islands by colonial nesting seabirds and wading birds in New Jersey was examined in five major phases. The first located dredged material islands from Manasquan to Cape May Inlets, NJ; the second recorded the past history of all colonial nesting seabirds and wading birds in New Jersey; the third recorded the vegetation patterns and succession on 21 dredged material islands; the fourth recorded the distribution in 1977 of colonial seabirds and wading birds in the study area and their utilization of dredged material islands; and the fifth documented those factors influencing the use and selection of dredged material islands by birds in 1977. Plant communities were placed into 15 categories. The most important ones for birds on the dredged material study islands were bare, common reed, reed-shrub, shrub, shrub-forest, shrub-dense grassland, and dense grassland. No statistically significant vegetation differences were found between the bird (colony) and vegetation (non-colony) study islands, thus other factors, notably microtopography, past history of colony success, and freedom from disturbance by quadruped predators and humans, seem most important in determining island use by birds, given certain minimal habitat requirements. Nineteen management recommendations for dredged material islands are stated. (WES)
W79-01658

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01659

A STUDY OF LEACHATE FROM DREDGED MATERIAL IN UPLAND AREAS AND/OR IN PRODUCTIVE USES,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5B.
W79-01660

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
S. S. Barr, R. H. Miller, and J. T. Logan.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 709-717, April, 1978. 6 fig, 5 tab, 17 ref. OWRT B-059-OHIO(2).

Descriptors: *Denitrification, *Spray irrigation, *Soil amendments, *Carbon, *Hardwood, Grasses, Return flow, Clay loam, Sands, Nitrates, Nitrogen fixing bacteria, Application methods, Waste water treatment, Waste water disposal, Municipal wastes.

Biological denitrification was investigated at soil sites irrigated with waste water by the Pennsylvania State University waste water management project. The three clay loam soil sites included a plot of reed canarygrass, a hardwood forest, and an abandoned field; the fourth mixed hardwood site was formerly designated as gameland and consisted of loamy sand. The sites had been spray irrigated with waste water since 1963; untreated control sites were also maintained and soil samples were collected at various depths four times in two years. The top 7.5 cm of the treated soil sites contained the highest organic carbon and total nitrogen levels, and carbon/nitrogen ratios. All soils and vegetation exhibited low denitrification potentials attributed to a shortage of available organic carbon. This assumption was supported when denitrification increased after glucose was added to the soils as a carbon source. Carbon supplements added in the form of plant residues in the wastewater could not support denitrification below the 15 cm root zone, indicating that excess nitrate would leach into the groundwater. Reducing nitrogen levels in the waste water and increasing carbon sources during periods when crops were not grown was recommended. (Lisk-FIRL)
W79-01729

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-01738

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENT (PART 3) - RECOVERY AND REUSE OF ALUM SLUDGE (PARUPU HAISUI GYOSHU SHORIHO NO KENKYU (DAI-SANPO) - RYUSAN ARUMINYUMU SHORI SURAJI NO KUROZU KA SHORI),
T. Horikoshi, O. Ebinuma, and M. Yamagoshi.
Kami Pa Gikyoshi (Jour of the Japanese Technical Assoc. of Pulp and Paper Industry), Vol. 32, No. 10, p 46-51, 1978. 13 fig, 7 ref.

Descriptors: *Flocculation, *Recycling, *Pulp wastes, *Sludge disposal, *Pulp and paper industry, Separation techniques, Coagulation, Air pollution control, Sludge treatment, Chemical oxygen demand, Color, Industrial wastes, Waste water treatment, Waste water disposal.

Research at the Oji Paper Co., Ltd., in Japan on the flocculation and treatment of pulp mill effluent examined methods to recover and reuse alum sludge as a coagulant for COD and color removal. Alum recovery was achieved by reaction of kraft pulp effluents with sulfuric acid which had been generated using sulfur dioxide from boiler stack gases. Alum sludge ash prepared at pH 12.0 with Ca(OH)2 was successfully recovered by treatment with sulfuric or hydrochloric acid, followed by incineration at 900C. Alum sludge prepared at a low pH of 5-8 was treated with lime or calcium carbonate before incineration; this method also provided a reusable product. Closed systems were designed for both the high and low pH sludges. The low pH system incorporated mixing with alum and lime, clarification, mixing with lime and calcium carbonate, dewatering, incineration, reaction with sulfuric or hydrochloric acid, and separation of insoluble materials before recycling of the alum to the first stage of the treatment process. The system could be augmented with desulfurization of stack gases to provide the sulfuric acid. (See also W76-09284) (Schulz-FIRL)
W79-01758

Group 5E—Ultimate Disposal Of Wastes

STATE OF THE ART REPORT ON PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
R. R. Wilkinson, E. W. Lawless, A. F. Meiners, T. L. Ferguson, and G. L. Kelso.
ACS Symposium Series, No. 73, p 73-80, 1978. 22 ref.

Descriptors: *Incineration, *Pesticides, *Ozone, *Ultraviolet light, *Industrial wastes, *Biological treatment, Herbicides, 2,4-D, DDT, Organic pesticides, Carbamate pesticides, Total organic carbon, Costs, Pesticide removal, Waste treatment, Waste water treatment.

A state-of-the-art review of pesticides disposal research is presented with particular emphasis on high-temperature incineration, physicochemical methods, and bioconversion technology. High-temperature incineration has been employed for organic pesticides, Kepone, Mirex, organochlorine process wastes, and Herbicide Orange; efficiencies of up to 99.9% are possible with incineration although capital costs are high and scrubbing may be required. A data base covering incineration of pesticides has been established. Chlorolysis, Zimpro wet oxidation, and ozone/ultraviolet (UV) irradiation comprise the current chemical treatment methods used for pesticides. Wet oxidation with air or oxygen has yielded substantial reductions in total organic carbon (TOC) levels of wastes containing DDT, 2,4-D, pentachlorophenol, Amiben, and Atrazine; further studies to monitor the effects of wet oxidation on the active ingredients, rather than TOC alone, are recommended. Chlorolysis has been proven particularly effective for high chlorinated and diene-based pesticides. Ozone/UV irradiation has been optimized for chlorinated hydrocarbons, organophosphates, and carbamates. Microbial degradation has been successfully employed to decompose parathion into simpler phosphoric acids and phenols. (Schulz-FIRL)
W79-01764

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-01774

LEATHER TANNING INDUSTRY-SLUDGE PROBLEMS AHEAD,
R. Dawson.
Sludge Magazine, Vol. 1, No. 5, p 24-27, September-October, 1978.

Descriptors: *Chromium, *Tannery wastes, *Sludge disposal, *Heavy metals, *Industrial wastes, Ultimate disposal, Recycling, Fertilizer, Sludge treatment, Dewatering, Oxidation, Waste water treatment.

Approximately 80-85% of the leather tanned by the 298 tanneries in the U.S. is treated by chromium processes which generate large quatities of potentially hazardous sludge containing Cr(III), Zn, Pb, and Cu. A tabulation by states and regions of the projected leather tannery waste generation is presented for the wet and dry total process solid waste and total potentially hazardous wastes for 1977 and 2983. A survey by SCS Engineers noted that filter pressing was the preferred method for dewatering sludge and that 60% of the sludge was ultimately landfilled. New EPA standards for hazardous waste disposal are anticipated to be proposed during 1979. Current studies are examining methods to recover the chromium and the effects of using tannery sludges as soil conditioners or fertilizers. The APS catalytic molten salt incineration system is designed to burn off the organics and produce a chromium-rich ash. (Schulz-FIRL)
W79-01779

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01840

POLLUTION CONCENTRATIONS IN RUNOFF WATER FROM REFUSE PILES,
Auburn Univ., AL. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01892

ECOLOGY AND PATHOLOGY OF WILDLIFE IN RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT - PHASE I,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
For primary bibliographic entry see Field 5C.
W79-01902

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01991

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
For primary bibliographic entry see Field 5C.
W79-01998

5F. Water Treatment and Quality Alteration

VIRUSES IN FINISHED WATER: THE OCCOQUAN EXPERIENCE,
Health Effects Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W79-01577

STUDY OF WATER TREATMENT EFFECTS ON ORGANIC VOLATILES IN DRINKING WATER,
Alabama Univ., University. Dept. of Chemistry.
M. Thomason, M. Shoults, W. Bertsch, and G. Holzer.
Journal of Chromotography, Vol. 158, p. 437-447 1978. 3 fig, 3 tab, 43 ref. OWRT A-056-ALA(1).

Descriptors: *Water treatment, Gas chromatography, *Mass spectroscopy, Hydrocarbons, Volatile organics, *Pollutant identification.

Volatile organics were determined during all stages of the water treatment process in a municipal water works. Analytical parameters for a quantitative procedure were investigated. The method used allows simultaneous determination of both halogenated and non-halogenated purgeable organics. Approximately 70 substances were identified by gas chromatography-mass spectrometry with capillary columns. Well water contained considerable quantities of aliphatic and aromatic substances. Halocarbons were formed during both steps of a double chlorination procedure, but the largest quantity was generated during the first step. Only tetrachloroethylene was present in untreated surface water in significant quantities. Most hydrocarbons were carried through the treatment process from the raw water to the finished water with little change in concentration.
W79-01722

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst. Oxford.
For primary bibliographic entry see Field 5G
W79-01741

BDELLOVIBRIO AND THE INTESTINAL FLORA OF VERTEBRATES,
Auburn Univ., AL. Dept. of Microbiology.
J. M. Westergaard, and T. T. Kramer.
Applied and Environmental Microbiology, Vo 34, No. 5, p 506-511. Nov. 1977, 3 fig, 15 tab, 1 ref. OWRT B-061-ALA(3).

Descriptors: *Bdellovibrio, Alimentary tract, *In testinal microflora, *Bacteria, Water pollution e fects, Potable water, Water treatment, *Nonpath genic bacteria.

Bdellovibrio strain MS7 force-fed to fish and fro via an intragastric tube did not become an integr component of the intestinal microflora. Strain MS fed to mice in drinking water was not recovere from the intestinal tract of mice. However, vitro, the organism multiplied in intestinal conten of frogs and mice. Bdellovibrio inoculated in rabbit ileal loops was greatly reduced in numb within 24 h. It was concluded that strain MS could be considered nonpathogenic to animals, least when introduced into the digestive tract, a that it is not feasible at the present time to ly pathogenic, gram-negative bacteria in the alime tary tract with Bdellovibrio.
W79-01742

METHOD OF SEPARATION OF FLUORID ION FROM WATER,
M. Kanai.
U.S. Patent No. 4,104,159, 7 p, 2 fig, 2 tab, 9 re Official Gazette of the United States Patent Offic Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Water treatment, *Wat purification, *Separation techniques, Fluoride Adsorption, Flocculation, Electrolysis.

To remove fluoride from raw water, whether t fluoride is in solution as an ion or in the form o colloidally-dispersed salt, calcium ions are first troduced into the water. The resultant calciu fluoride is adsorbed on a floc during passage electric current through the raw water. The fl may be formed from organic matter already pre ent in the raw water or from diatomaceous ear floc in a separate operation, the diatomaceo earth floc then being added to the raw wat Adsorption on floc whether originating in orga matter or in diatomaceous earth is facilitated the passage of electric current through the r water and by the addition of a surfactant. (Sinh OEIS)
W79-01873

WATER SOFTENING SYSTEM,
J. W. Braswell.
U.S. Patent No. 4,104,165, 9 p, 8 fig, 9 ref; Offic Gazette of the United States Patent Office, V 973, No 1, p 277, August 1, 1978.

Descriptors: *Patents, *Water treatment, *Wa softening, Hardness(Water), Water purificati Ion exchange, Separation techniques, Resins, Flo control, Regeneration.

The water softening system employs a treatme tank containing a mineral bed of ion-exchan resin granules, a brine tank, and valve means periodically cycling water through the mineral b for removing hardness and other undesirable f tors. Then a saturated brine solution is pas through the bed counter-current to its normal se ice flow to recondition it and subsequently the b is flushed to cleanse the granules and remove undesirable matter. The control means for system includes electrically operated solenoid d phragm valves, and a plunger valve responsive water pressure, for controlling and regulating flow of water and brine through the mineral b

enturi aspirator means are incorporated in the unger valve, so that a saturated brine solution is awn, in a direction counterflow to service flow rough mineral beds. The bed is flushed with ater in successive counterflow and concurrent w directions to cleanse, rinse and resettle the d in preparation for the subsequent service cle. (Sinha-OEIS)
79-01878

ATER REUSE HIGHLIGHTS, A SUMMARY OLUME OF WASTEWATER RECLAMATION ND REUSE INFORMATION,
merican Water Works Association Research undation, Denver, CO.
or primary bibliographic entry see Field 5D.
79-01978

G. Water Quality Control

PPLICATION IN THE WATER INDUSTRY F REGIONAL GEOCHEMICAL MAPS OF NGLAND AND WALES,
nperial Coll. of Science and Technology, London ngland). Applied Geochemistry Research roup.
or primary bibliographic entry see Field 5B.
79-01501

ATER RESOURCES PLANNING FOR IVERS DRAINING INTO MOBILE BAY,
labama Univ., University. Dept. of Chemical and etallurgical Engineering.
or primary bibliographic entry see Field 4A.
79-01510

EDIMENT CONTROL CONFERENCE, HELD T HELENA MONTANA ON DECEMBER 15, 972.
ational Association of Conservation Districts, ashington, DC.
or primary bibliographic entry see Field 4D.
79-01523

HE EFFECT OF IRRIGATION ON THE SUR-IVAL AND DEVELOPMENT OF PARASITIC EMATODE LARVAE IN WESTERN MON-ANA,
ontana State Univ., Bozeman.
or primary bibliographic entry see Field 5C.
79-01540

YDROLOGIC CHARACTERISTICS OF OAL-MINE SPOILS, SOUTHEASTERN MON-ANA,
ontana Coll. of Mineral Sciences and Technol-gy, Butte.
or primary bibliographic entry see Field 5B.
79-01542

MPROVEMENT AND EVALUATION OF ECHNIQUES FOR THE MECHANICAL RE-IOVAL AND UTILIZATION OF EXCESS QUATIC VEGETATION,
isconsin Univ.-Madison. Dept. of Mechanical; nd Wisconsin Univ.-Madison. Dept. of Agricul-ral Engineering.
or primary bibliographic entry see Field 4A.
79-01584

NVESTMENT PLANNING FOR COLORADO IVER SALINITY CONTROL,
alifornia Univ., Los Angeles. Graduate School of anagement; and California Univ., Los Angeles. ept. of Engineering Systems.
. Erlenkotter, and C. R. Scherer.
n: 'Colorado River Basin Modeling Studies' Semi-ar Proceedings, held July 16-18, 1975 Published arch 1976, Utah Water Research Laboratory, ogan, p. 71-85. 1 fig, 2 tab, 11 ref, (California ater Resources Center Project UCAL-WRC-W-74). OWRT B-170-CAL(1).

Descriptors: *Mathematical models, *Colorado River, *Salinity control, Costs, Economics, Model studies, Investment, Planning.

This study considers the problem of scheduling investment in salinity control projects on the Colorado River. Each project offers the possibility of preventing an amount of salt from entering the river. Diversions (consitent with 'present modified' flows) are made along the river for various users. These users (primarily lower basin) incur damage as river salinity rises with time due to intensifying use upstream. The problem is to find that schedule of investments which minmizes the discounted sum of project investment and operating costs, ad downstream salinity damages over time, subject to optional equity-oriented restrictions on (1) financing arrangements and (2) quality at selected points along the river. Note that while quality restrictions are mentioned, they are optional. Hence this is more than a cost-effective analysis. Rather, the approach taken is to let the salinity profile of the river be determined endogenously within the model, with the optimal timing of investment based on the dynamic trade-off of investment costs and associated downstream damages. (Snyder-Calif, Davis)
W79-01587

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 6G.
W79-01591

ADVENTURES IN DESIGNING FOR 1984 EFFLUENT REDUCTION,
Gulf States Paper Corp., Tuscaloosa, AL.
R. R. Fuller.

Descriptors: *Pulp and paper industry, *Water pollution control, *Treatment facilities, *Legislation, *Design, *Alabama, Pulp wastes, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Biological treatment, Tertiary treatment, Solid wastes, Biochemical oxygen demand, Freshwater, Water purification, Water reuse, Recycling, White liquor(Kraft process), Green liquor(Kraft process), White water(Paper machines), Kraft mills.

A review is presented of the impact of proposed 1984 effluent discharge regulations on the design of water pollution control facilities at an integrated kraft pulp and paper mill in Tuscaloosa, Alabama. Existing treatment facilities (including the UNOX biological process) and tertiary treatment alternatives are discussed in terms of their potential for removing solid wastes, 5-day BOD, and effluent solids generated during pulp washing and screening, green and white liquor and fresh water clarification, evaporatory clean-out, and white water recycling. (Swichtenberg-IPC)
W79-01608

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
For primary bibliographic entry see Field 6E.
W79-01631

NBC REQUESTS EXEMPTION FROM RUNOFF RULES.
Feedstuffs, Vol. 48, No. 6, p 22, February 9, 1976.

Descriptors: *Poultry, *Regulation, Water pollution, *Broilers, *National Pollutant Discharge Elimination System.

The National Broiler Council (NBC) has filed a request with the Environmental Protection Agency asking an industry exemption from proposed regulations that would require National Pollutant Discharge Elimination System (NPDES) permits for large broiler operations. Broiler growout operations with more than 290,000 birds for a cumulative total of 45 days in any 12-month period would be considered a 'concentrated animal feeding operation point source' in the eyes of the regulation. In the event EPA cannot grant an industry exemption, NBC said the criteria for determining whether a broiler operation has a measurable discharge of pollutants into navigable waters should be clarified. (Ott-East Central)
W79-01649

KANAWHA RIVER INVESTIGATION OF WATER QUALITY AND WATER POLLUTION CONTROL PRACTICES. VOLUME II: REPORTS OF INDUSTRIAL INVESTIGATIONS ON SEVEN INDUSTRIES.
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
For primary bibliographic entry see Field 5D.
W79-01654

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. M. Walski, and P. R. Schroeder.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 062 Price codes: A06 in paper copy, A01 in microfiche. Technical Report-D-78-18, May 1978. 106 p, 3 append, 33 fig, 35 ref.

Descriptors: *Effluents, *Weirs, *Stratified flow, Suspended solids, Design criteria, *Containment area, *Dredged material.

The suspended solids concentration in the effluent water from an upland containment area being filled with fine-grained dredged material can be significantly influenced by the length of the weir and the depth of the ponder water. This study develops a procedure for designing and operating the weir to maintain good effluent quality, given a flow and dredged material type. Stratified-flow and sediment-transport models were investigated to describe the depth of withdrawal, velocity profile, and effluent suspended solids concentration, given a concentration profile and flow. Field data on these parameters were collected at three sites--Yazoo River, MS, Fowl River, Al, and Oyster Bay, AL. The Waterways Experiment Station's selective withdrawal model developed by Bohan and Grace, modified to fit observed data, was selected as the basis of the design procedure. Using this model, nomograms were developed for the design procedure for silt and saltwater clays ad for freshwater clays. Proper operation of the weir can ameliorate the effects of short-circuiting or an undersized basin. In general, the weir crest should be maintained at as high an elevation as feasible during dredging operations. Guidance for operation of the weir for special applications is also presented. (WES)
W79-01655

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-01665

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W79-01674

NITRAPYRIN DEGRADATION AND MOVEMENT IN SOIL,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.

W79-01706

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01714

EFFECT OF NITRAPYRIN ON NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Illinois Univ. at Urabana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-01717

IRRIGATION TIMING-ITS INFLUENCE ON THE EFFECTS OF SALINITY AND WATERLOGGING STRESSES IN TOBACCO PLANTS,
Victoria Dept. of Agriculture, Tatura (Australia). Horticulture Research Station.
For primary bibliographic entry see Field 3F.
W79-01720

DECISION MAKING IN A MULTIPLE-USE APPROACH TO THE RECLAMATION OF STRIP-MINED LANDS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. School of Renewable Natural Resources.
A. Goicoechea, L. Duckstein, and M. Fogel.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 69-78. 1 fig, 4 tab, 13 ref. OWRT B-043-ARIZ(27), B-055-ARIZ(1).

Descriptors: *Model studies, *Mathematical models, *Decision making, *Multiple-purpose projects, *Strip mine wastes, *Reclamation, Arizona, Black Mesa, Livestock, Runoff, Mine wastes, Flow augmentation, Farming, Crops, Sediment control, Fish harvest, Ponds.

Using the Black Mesa area in northern Arizona, a case study was made based on a decision making algorithm called PROTRADE (Probabilistic Tradeoff development Method). Five objectives to be achieved in reclaiming this overgrazed and now mine-spoiled acreage were considered: (1) livestock production, (2) augmentation of water runoff), 3) farming of selected crops, (4) control of sedimentation rates, and (5) fish ponds harvesting. The methodology employed in this study is given by way of formulae applied to each of these objectives. Results indicate that the algorithm allows for objectives were in conflict and competition with each other, particularly in competition for water, goal values obtained were short of their maximum value of unity, with sediment being the exception. By expressing the functions of the objectives in their respective natural units, rather than in dollars, however, the decision maker is able to bring social, environmental, and aesthetic concerns into the analysis. The authors believe that the applicability of PROTRADE to realistic problems is feasible. (Paylore-Arizona)
W79-01730

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 15, No. 1, p 51-57, January-February 1977. 9 fig, 1 tab, 6 ref. OWRT A-060-CAL(1).

Descriptors: *Groundwater, *Water pollution, *Salts, *Irrigation, Salinity, Wells, Water wells, Irrigation wells, Aquifers, Dissolved solids, Water quality, Leaching, Groundwater recharge, Seepage, Infiltration, Agriculture, *Groundwater protection, Groundwater salinity.

One of the more subtle and dangerous areas of pollution is that occurring in groundwater from normal irrigation practices. The pollution from salt buildup is presently one of the unsolved problems in managing stream-aquifer systems. This paper presented several strategies that offer a possibility of controlling salt buildup. For example, instead of applying irrigation groundwater near the site of a well, the ASTRAN Method, described herein, transfers it downstream to be applied on land where the groundwater is a lower quality, thereby controlling the increase in salt concentration. Instead of preventing seepage loss in delivery canals, the percolating water is used to maintain groundwater quality. Finally, timed releases of return flow remove salts, without exceeding surface water quality constraints. (Sims-ISWS)
W79-01735

CONSUMER ATTITUDES TOWARD TASTE AND ODOR IN WATER,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 6B.
W79-01739

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst., Oxford.
K. W. Hollman, E. E. Milam, J. H. Sellers, R. F. Bush, and J. F. Hair, Jr.
Water and Sewage Works, Reference edition, p R-114-R-125. April 1978, 7 tab. OWRT A-116-Miss(1).

Descriptors: *Municipal water systems, *Model studies, *Cost efficiency, Performance, *Planning, Debt, Depreciation, Controllable cost, Uncontrollable cost, Multivariate, Pumpage, Treatment costs, Distribution systems, Water supply, Water treatment, *Mississippi water systems.

The objective was to generate a multivariate analytical model, using data from 45 Mississippi water systems as an information base, that would provide answers to these questions: (1) What factors play a part in achieving greater proficiency in regulating operating costs, and (2) To what extent do these factors affect efficiency. The criterion (dependent) variable consists of average total cost (ATC) per gallon of water; the twenty-two predictor (independent) variables are divided into four major costs/operations categories. The model (primarily using multiple discriminant analysis) measures several cost factors at varying levels of cost per gallon of delivered water for the one-third of the systems that were most efficient, the one-third that were the next most efficient, and the one-third that were least efficient. It identifies those economic, demographic, and water-related factors that are most closely associated with efficient water firms. Findings of the study will enable water system managers to determine the prevailing standards of cost performance in the industry and to bring current performance in line with industry averages. Findings will also be helpful to regulatory authorities and others interested in the most efficient use of water resources.
W79-01741

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01744

MICROFLORAL RESPONSE TO AQUATIC WEED DECOMPOSITION,
Massachussets Univ., Waltham. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W79-01746

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
For primary bibliographic entry see Field 5A.
W79-01747

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS - OR DID THE REAL SPILLER GET AWAY.,
Connecticut Univ., Storrs. Dept. of Statistics.
For primary bibliographic entry see Field 5A.
W79-01748

ARSENIC POLLUTION FROM UNDERDRAINAGE AND RUNOFF FROM GOLF GREENS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5B.
W79-01752

HOW TO CONDUCT A WASTEWATER SURVEY: PART II - DEVELOPING WASTE STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramus, NJ.
A. S. Vernick.
Plant Engineering, Vol. 31, No. 16, p 77-80, August, 1977. 1 fig, 2 tab.

Descriptors: *Surveys, *Industrial wastes, *Water utilization, *Sampling, *On-site data collections, Management, Alternate planning, Treatment facilities, Waste water treatment, Pollutant identification.

Procedures for developing individual waste stream profiles as part of a waste water survey are presented. Flow characteristics and pollutant loading are cited as the two major components of waste stream profiles. Water budget analysis is suggested to evaluate a plant's water usage and to reveal trends, seasonal variations, and other information about the plant's water needs. A typical plant water balance for average water consumption and waste water flow in various phases of operation is presented. Various methods for field measurement of water flow are described and compared. A flow diagram for processes related to a survey of water and waste water utilization is presented. Various methods to determine the composition of pollutants as a part of a waste stream profile are discussed. Three types of field sampling, including grab sampling, simple composite sampling and flow-proportioned sampling, and the operation of automatic sampling devices are examined. Analytical aspecsts of a sampling program are discussed, including preparation, preservation, and integrity of samples as well as the use of an independent laboratory to verify company lab results. The definition of waste stream profiles is recommended for evaluations of alternative treatment processes and for the development of an effective waste water management program. (See also W77-12465) (Schulz-FIRL)
W79-01760

REFINERY CYANIDES: A REGULATORY DILEMMA,
Air Products and Chemicals, Inc., Allentown, PA.
For primary bibliographic entry see Field 5D.
W79-01763

ETERMINATION OF POLYCHLORINATED IPHENYLS IN PAPER MILL EFFLUENTS - HE INFLUENCE OF SUSPENDED SOLIDS,
stitute of Paper Chemistry, Appleton, WI.
or primary bibliographic entry see Field 5A.
79-01771

FFECT OF SOIL MIXTURES AND IRRIGATION METHODS ON LEACHING OF N IN OLF GREENS,
elaware Univ., Newark. Dept. of Plant Science.
or primary bibliographic entry see Field 5B.
79-01777

HE EVOLUTION OF TANNERY EFFLUENT REATMENT--GUIDELINES FOR FURTHER NVESTIGATIONS,
or primary bibliographic entry see Field 5D.
79-01780

MPACT OF OFFSHORE OIL AND GAS DEELOPMENT ON THE COASTAL ZONE: REORMING THE IMPACT ASSESSMENT ROCESS,
utgers - The State Univ., New Brunswick, NJ. ept. of Environmental Resources.
or primary bibliographic entry see Field 6G.
79-01783

NVIRONMENTAL ASSESSMENT OF ALASAN CONTINENTAL SHELF. FINAL REORTS OF PRINCIPAL INVESTIGATORS, OL 1, BIOLOGICAL STUDIES.
ational Oceanic and Atmospheric Administraon, Boulder, CO. Outer Continental Shelf Envionmental Assessment Programs.
or primary bibliographic entry see Field 5C.
79-01811

NVIRONMENTAL ASSESSMENT OF THE LASKAN CONTINENTAL SHELF FINAL REORTS OF PRINCIPAL INVESTIGATORS, OL 2. BIOLOGICAL STUDIES.
ational Oceanic and Atmospheric Administraon, Boulder, CO. Outer Continenta Shelf Envionmental Assessment Program.
or primary bibliographic entry see Field 5C.
79-01818

NVIRONMENTAL ASSESSMENT OF THE LASKAN CONTINENTAL SHELF. FINAL REORTS OF PRINCIPAL INVESTIGATORS, OL. 3. BIOLOGICAL STUDIES.
ational Oceanic and Atmospheric Administraons, Boulder, CO. Outer Continental Shelf Envionmental Assessment Program.
or primary bibliographic entry see Field 5C.
79-01822

ABASH RIVER BASIN COMPREHENSIVE TUDY. VOL I. MAIN REPORT,
or primary bibliographic entry see Field 6B.
79-01830

HORT-TERM VARIATION OF THE CHEMIAL COMPOSITION OF THE NIAGARA IVER,
epartment of the Environmental, Burlington Ontario). Water Quality Div.
or primary bibliographic entry see Field 5A.
79-01831

EPORT OF WASTE SOURCE INVENTORY ND EVALUATION, DADE COUNTY, FLORDA.
nvironmental Protection Agency, Athens, GA. outheast Water Lab.
vailable from the National Technical Information ervice, Springfield, VA 22161 as PB-255 161, rice codes: A07 in paper copy, A01 in microfiche. ine 1971, 119 p, 5 tab, 3 fig, 11 append.

Descriptors: *Water pollution, *Waste water treatment, *Waste water(Pollution), *Water quality, *Biological oxygen demand, *Effluent, *Industrial wastes, Suspended solids, Chlorination, Sewage, Phosphorus, Coliforms, Surveys, Carbon, *Dade County(FL), *Atlantic Ocean, Flow meters, Removal efficiency, Average flow.

This is a report of a survey of 76 major and minor municipal wastewater treatment plants in Dade County, Florida, undertaken between November 1970 and February 1972 to judge their treatment efficiency, adequacy of bacterial disinfection, and effluent loading. Twenty-four-hour composite samples were collected from influent and effluent using automatic samplers. Laboratory analyses were conducted on influent and effluent for 5-day BOD, COD, total suspended solids, volatile suspended solids, total organic carbon, and settleable solids. Effluent samples were analyzed for nitrogen compounds, total phosphorus and chlorides. Daily grab samples of the effluent after chlorination were analyzed for chlorine residual, pH and total coliform bacteria. Temperature, chlorine residual and flow were determined in the field. Also included is an industrial waste inventory which locates and identifies significant industrial waste resources. Summary tables are presented showing average flow, population served, removal efficiency, type of treatment, destination of effluents, and remarks concerning each municipal WWT plant. For each industrial pollution source identified, the type of pollution problem, and status of the company's actions to rectify the problem, are reported. It was found that Dade County waters are being contaminated by municipal and industrial wastes and that 21% of municipal waste volume receives inadequate treatment, while 77% receives no treatment. A major recommendation is that a regional collection and treatment system to serve all waste sources in Dade County be in operation to ensure secondary treatment of all wastes, with removal efficiencies of not less than 90%, and with discharge of treated effluents to the Atlantic Ocean. (Coan-NC)
W79-01834

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER, SOUTH DAKOTA, 1970.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 255, Price codes: A05 in paper copy, A01 in microfiche. Report SA/TA-10, November 1972, 78 p, 10 fig, 33 tab, 2 append.

Descriptors: *Water quality, *Water pollution, *Runoff, *Stream pollution, *Pollution(Water), Turbidity, Suspended solids, Phosphorus, Biological oxygen demand, Dissolved oxygen, Pesticides, Coliform, Rivers, Alkalinity, *South Dakota, *James River(SD), *Feedlots, Fish life propagation, *Survey data, *Dissolved gases.

The study reported in this document was undertaken to determine the pollutional contributions of the Sand Lake Migratory Waterfowl Refuge and the effect of agricultural practices on the water quality of the James River in South Dakota. The field study was divided into two phases, a spring or runoff study, and a summer or low flow study, both undertaken in 1970. The James River originates near Fessendon, ND and travels south about 710 miles to the Missouri River east of Yankton, SD. The greatest flow in the James usually occurs in March and April when snowmelt is greatest. Peak discharges are also experienced from May through June because of heavy rainfall. Annual low flows occur in late summer, autumn, and winter. The field laboratories conducting the study were located near the sewage treatment pumping station in Huron. The samples collected were 'grab' type and were taken at staggered times throughout the day. Samplers made field determinations for dissolved oxygen, temperature and pH, and collected water samples for other laboratory investigations. The laboratory determinations included 5-day BOD, dissolved oxygen, pH, conductivity, turbidity, suspended solids, alkalinity, and coliform, among others. Pesticide samples were also collected. The results of all bacteriological, chemical, and physical determinations are tabulated in the appendix. The contributions of the Sand Lake Migratory Waterfowl Refuge and agricultural practices to water quality could not be adequately assessed due to unfavorable stream and weather conditions. However, it was found that runoff from feedlots caused a significant decrease in the amount of dissolved oxygen and that BOD concentration also increased quite drastically as a result of feedlot runoff. The problems were exacerbated during low-flow periods. (Coan-NC)
W79-01837

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN. REGION VIII. COLORADO, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, UTAH, WYOMING.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 280, Price code: A07 in paper copy, A01 in microfiche. November 1971, 132 p.

Descriptors: *Water pollution control, *Oil spills, *Water pollution sources, *Oil pollution, Hazards, Accidents, Fish, Federal government, State government, Local government, Colorado, Montana, Wyoming, North Dakota, South Dakota, Utah, *Contingency planning, Hazardous spills, Oil pollution removal, Regional planning, Personnel, Public administration.

This report is a compilation of agencies and organizations, both federal and state, responsible for coordinating reactions to an oil spill or spills of other hazardous substances occurring in the navigable waters of Region VIII. The regional contingency plan of Region VIII follows the general format of the national contingency plan. In the event of an oil spill or large fish kill, the EPA is notified and takes the necessary first steps. A Regional Spill Emergency Team is formed; its functions are to investigate the spill and report possible federal statute violations, provide needed resources, conduct ecological surveys and investigations, coordinate personnel from other agencies and notify all affected jurisdictions. The geographic boundary of Region VIII is described, along with major navigable waters. Informational data are listed for all government agencies and private firms involved when spills of hazardous substances occur. (Coan-NC)
W79-01842

ENVIRONMENTAL ASSESSMENT OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC.
January 1977, 112 p. 68-01-3195.

Descriptors: *Water quality management, *Air pollution, *Environmental effects, *Land use, *Economic impact, *Social impact, *Planning, Data collection, Employment, Runoff, Water supply, PL92-500, *Regional impact assessment, *Ecological impact, *Impact assessment, 208 areawide plans, Critical land areas.

This report is designed to assist managers and staff of planning agencies in assessing the natural and man-made environmental impacts of their recommendations for alternative water quality management (WQM) plan elements. The function of these plan elements is to improve the physical environment in accordance with minimum levels of waste treatment technology as required by PL92-500. This handbook focuses on key assessment questions in the areas of water quality and quantity, land use, air quality, ecological quality, economics, visual quality, and other social impacts. Impacts, impact measurements and data needs are presented, and important questions arising from an impact assessment study are discussed. Each step of the process, from identifying problems in meeting water quality goals, to the selection of an areawide plan, is tied to assessing its impact on the environment. The

handbook sets out several steps when marking an environmental assessment and shows the relationship of the environmental assessment process to the planning process. The environmental assessment steps include identifying community goals and objectives relating to environmental considerations; assessment of possible environmental effects and collection of data; a detailed environmental assessment of alternative plans; development of possible mitigration measures and soliciting public involvement to determine the significance of environmental effects in relation to community goals and objectives; decisions on environmental impacts; and finally, at the time of the areawide WQM plan is selected, documentation of the assessment. (Coan-NC)
W79-01844

COMPREHENSIVE WATER QUALITY MANAGEMENT FOR THE STATE OF SOUTH DAKOTA. 303(E) BASIN PLAN FOR THE MINNESOTA RIVER BASIN.
South Dakota Dept. of Environmental Protection, Pierre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 417, Price codes: A08 in paper copy, A01 in microfiche. 1976, 161 p, 25 tab, 4 graph, 2 fig, 7 append.

Descriptors: *Water quality management(Applied), Water quality, *Planning, *Water pollution, *Water pollution control, Regulation, Water quality standards, Effluent, Discharge, Wastes, Organic wastes, Dissolved solids, Suspended solids, Non-point source pollution, *South Dakota, *Minnesota River Basin, 303(e) Basin Plans, Regional planning, Turbidity.

This report presents South Dakota's strategy for correcting water pollution, thereby improving and maintaining water quality in the Minnesota River Basin. The Basin drains approximately 1,572 square miles in portions of six counties. There are currently three active Water Quality Monitoring (WQM) stations in the Basin. The Basin has generally high quality water but downward sloping topography with resulting erosion is causing some sedimentation and eutrophication problems. The proposed Whetstone River Diversion Project should help reduce these problems. The report inventories point source discharge resulting from municipal, industrial, and agricultural sources and includes tables describing the receiving waters, effluent limitations, type of treatment, and their compliance with water quality standards. The contributors to non-point source pollution are streamside grazing, overgrazing, and natural soil erosion which add organic and inorganic loadings to the waterways. Urban non-point source pollution is not a problem. Several types of monitoring and surveillance activities are conducted annually in the Basin, including operation and maintenance inspections of wastewater treatment (WWT) facilities, compliance monitoring, and inspections of problem feedlots. The main strategies for improving water quality in the Basin consist of erosion control measures, increased cooperation between relevant governmental agencies, increased research and control of non-point source pollution, establishing more WQM stations, and lowering the maximum suspended solids criterion to a maximum of 70 mg/l. (Coan-NC)
W79-01846

INNOVATIVE MANAGEMENT CONCEPT FOR 208 PLANNING,
Michigan Univ., Ann Arbor. Civil Engineering and Natural Resources.
J. W. Bulkley, and T. A. Gross.
Journal of the Water Resources Planning and Management Division (ASCE), Vol. 103, p 227-239, November 1977. 4 fig, 16 ref.

Descriptors: Water resources, *Planning, *Management(Administrative), *Water law, Water use, Water quality, Economics, Legislation, Water, *Thames Water Authority, *208 Planning, *Regional water resource planning, Management reorganization, Financial sources, State laws, Federal laws, Efficiency.

This article addresses the organizational problems arising from the implementation of 208 area-wide water quality planning programs. Criteria have been developed to provide a basis for evaluation of the organizational arrangements by which water services are provided in complex urban areas. These criteria are: the organizational arrangements should include the means for resolving conflicts among all users of water in the region; efficient use should be made of all resources in the provision of water services; financial sources should be adequate and flexible; river basins should be recognized as the units most appropriate to the management of water resources; agencies should be free to employ a wide range of techniques in accomplishing their goals; agencies should be accountable to the entire population served and responsive to its needs and desires; the organizational arrangements for water services should be compatible with the overall government structure; costs and benefits should be distributed equitably throughout the whole region. A short discussion and rationale is provided for each criterion. The Thames Water Authority management structure was described as a possible model for reorganization of U.S. water resource planning. This Water Authority incorporated many previously autonomous water functions under one organizational structure. Decisions were obtained more rapidly, tighter control over the planning process was realized, the reorganization provided the opportunity of all divisions to draw upon the resources of the Authority as a whole, and other benefits were realized. The report concludes with recommendations on how to develop alternative water resource management schemes. (Coan-NC)
W79-01848

ADSORBENT PROCESS FOR OILY MATERIALS,
Daicel Ltd., Sakai (Japan). (Assignee).
A. Zenno, T. Uebayashi, I. Maruyama, and H. Shiono.
U.S. Patent No. 4,102,783, 11 p, 13 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1614, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality ontrol, Adsorption, Floating, Separation techniques, Cotton, Fibers(Plant).

An adsorbent used for effectively collecting or removing oily materials floating on water or emulsified or dispersed in water is composed mainly for unrefined lints or unrefined linters together with, if necessary, filter papers, synthetic fibers or natural fibers. These materials are mainly formed into a mat, a strand, etc, or can be used in the form of a fixed bed or a fluidized state. The lints are the long fibers recovered first from cotton seed using a cotton gin and are formed into spun yarns and fabrics in a fibrous state using a cotton system spinning machine. However, the cotton seed from which the lints have been recovered further contains short fibers which can also be recovered and they are called linters. (Sinha - OEIS)
W79-01864

APPARATUSES TO SEPARATE MIXTURES OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES,
Machinefarbiek Geurtsen Deventer, NV. (Netherlands). (Assignee).
A. A. Geurtsen.
U.S. Patent No. 4,102,787, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1615-1616, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, *Water quality control, Separation techniques, Specific Gravity, Ballast water, Gravity separation.

An apparatus to separate a mixture of liquids of different specific gravities, e.g. oil and water, comprises a closed vessel containing a separation space, an upper chamber situated above the separation space, a partition mounted for vertical movement between a lowest and a highest position to control regulating and/or signalling device. The partition separates the upper part of the separation space from the upper chamber. The vertically movable partition provided between the separation space and the upper chamber is a diaphragm or a bellows which is attached to the wall of the vessel in a liquid tight manner. A collecting chamber for the heavier liquid is situated under the separation space and is provided with a discharge conduit. (Sinha-OEIS)
W79-01865

HYDRO-CARPET OIL SPILLAGE CONTAINMENT AND RECOVERY DEVICE,
Amerada Hess Corp., Woodbridge, NJ. (Assignee).
R. W. Young.
U.S. Patent No. 4,102,789, 5 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1616, July 25, 1978.

Descriptors: *Patents, *Water pollution control, *Water quality control, *Oil spills, *Oil pollution, Barriers, Obstruction to flow, Equipment, Absorption.

A hydro-carpet apparatus is primarily for providing an emergency containment potential for small oil spills. These spills may result from transferring petroleum products either from a land based supply on shore to a vessel or vice versa. The invention is so arranged that its components can be positioned and placed in a usable state by a single workman without the assistance of additional personnel or by the use of any mechanical equipment. The invention comprises a wheeled container which is placed downstream at the edge of a dock or bulkhead from the point at which the transfer is to take place. The arrangement is so conceived that in the event of a spill a messenger line is pulled smartly, thus tripping the container door and, from this, making it possible to release a carpet roll previously stored in the container so that it can be almost instantly pulled out of the container in such fashion that is balls to the water surface after being unreeled. The carpet contained within the container is formed of surbent material which will temporarily contact and contain, as well as either adsorb, or absorb oil products. (Sinha-OEIS)
W79-01866

METHOD AND APPARATUS FOR PURIFICATION OF WATER,
Ebara Infilco Kabushkik Kaisha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W79-01886

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 8G.
W79-01887

OIL SPILL RETRIEVAL SYSTEM,
J. J. Janson.
U.S. Patent No. 4,105,554, 7 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 738, August 8, 1978.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water quality control, Separation techniques, Boats, Monitoring, *Oil recovery.

The invention provides an oil spill retrieval system including apparatus for collecting the oil from the surface of a body of water and for processing the collected oil to remove the water collected with it and to return the cleaned water back to its source. The system includes a boat which carries the collecting and processing apparatus. The significant feature is not processing to provide clean oil but rather processing the mixture so that the removed oil has a minimum of water content to reduce the volume required to be stored until the boat can unload. The other significant feature is to process the removed water until its contaminant level

h oil) is low enough to permit its discharge
to its source. (Sinha-OEIS)
9-01889

ROGEN LOSSES FROM SPRINKLER-AP-
ED NITROGEN FERTILIZER,
raska Univ., North Platte. Dept. of Agronomy.
primary bibliographic entry see Field 3F.
9-01893

ENIC LEVELS IN THE SURFACE AND
OUND WATERS ALONG WHITEWOOD
EEK, BELLE FOURCHE RIVER, AND A
RTION OF THE CHEYENNE RIVER,
UTH DAKOTA,
logical Survey, Vermillion, SD.
primary bibliographic entry see Field 5A.
9-01897

ECONOMIC AND ENVIRONMENTAL
ALUATION OF ALTERNATIVE LAND DE-
LOPMENT AROUND NEW HAMPSHIRE
KES,
v Hampshire Univ., Durham. Inst. of Natural
Environmental Resources.
A. Andrews, and J. A. Pickering.
ilable from the National Technical Information
vice, Springfield, VA 22161 as PB-289 375,
e codes: A04 in paper copy, A01 in microfiche.
er Resources Research Center, University of
v Hampshire Research Report No. 17, 1978. 46
fig, 10 tab, 32 ref, 3 append. OWRT A-038-
(2).

criptors: *Economic impact, *Environment,
ganic loading, *Water quality, *Phosphorus,
luation, Mathematical models, Linear pro-
nming, Lakes, Lake shores, Recreation, Land
elopment, Economics, *New Hampshire, Al-
ative land development, Phosphorus loading,
mmercial developments, Residential develop-
ts.

overall objective was to evaluate alternative
developments around New Hampshire lakes.
analytical method used was based on a combi-
on of a mathematical programming model and
hosphorus nutrient budget model. Alternative
elopment patterns, evaluated by their impacts
the lake area environment and area economy,
uded residential patterns, commercial patterns,
combinations of these two types. Economic
act from each alternative development was
sured in terms of net public revenue and total
ate expenditures to the local area, to the State
to other states. The impact of the alternative
elopments on the lake area environment was
sured in terms of crowding levels and the level
hosphorus concentration in the lake. Phospho-
loading of the lake water was used as a proxy
able to reflect the changes in the lake water
lity. Commercial developments yielded the
est revenues to the town and local areas. It
attracted the most lake users to the area as
l as contributing the largest phosphorus loading
he lake waters. Residential developments, al-
ugh contributing high total revenues to the
, yielded less net revenue to the town. Phos-
rus loading levels from residential develop-
ts were much lower than lake phosphorus
ding by commercial developments.
9-01904

MPUTER MODEL FOR PREDICTING POL-
TION IN THE MISSOURI,
ssouri Univ.-Columbia. Dept. of Civil Engineer-
primary bibliographic entry see Field 5B.
9-01905

CURRENCE OF IRON BACTERIA IN
OUND WATER SUPPLIES OF ALABAMA,
burn Univ., AL. Water Resources Research
t.
primary bibliographic entry see Field 5B.
9-01908

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Coll. of Engineering.
J. D. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 807, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, May, 1977. 78 p, 8 fig, 12 tab, 22 ref, 7 append. OWRT B-008-LA(1). 14-31-0001-5078.

Descriptors: *Eutrophication, *Lake restoration, *Nutrient inactivation, *Sediment sealing, *Farm ponds, *Water quality, Nutrient cycling, Clay soils, Aquatic ecology, Lakes, Reservoirs, Impoundments, Nutrients, Pollutants.

The objective was to determine if the application of clay soils to nutrient-rich pond water would be effective in reclaiming the usefulness of eutrophic farm ponds. Clay particles were to serve as a nutrient inactivant and bottom sediment sealant. Pond water was isolated (in situ) with polyethylene columns. Three clay soil types were used at three application rates on four sites of 12 columns each within the pond: nine columns for the different treatments and three control columns. Three sites were treated in July and the fourth in February. Water samples were taken from the columns and the pond before and after treatment. Samples were analyzed for various water quality parameters to determine the effectiveness of each treatment. Results indicated that under the experimental conditions of this study, application of clay soil within columns in the summer did not effectively reduce productivity or limit nutrient availability. Visual observations of pond productivity indicated that the winter treatment was more effective. It is suggested that clay not be eliminated from consideration as a nutrient inactivant, but further study should be initiated to determine the effects of season of treatment.
W79-01988

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
For primary bibliographic entry see Field 5C.
W79-01998

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SEQUENCING COMPETITIVE EXPANSION PROJECTS,
California Univ., Los Angeles. Graduate School of Management.
D. Erlenkotter, and J. S. Rogers.
Operations Research, Vol. 25, No. 6, Nov.-Dec., 1977, p. 937-951. 1 fig, 21 ref. (California Water Resources Center Project UCAL-WRC-W-474). OWRT B-170-CAL(6).

Descriptors: *Model studies, *Mathematical studies, Economics, *Mathematical models, *Optimization, *Investment, Planning.

A solution approach is developed for finding the sequencing of a finite set of capacity expansion projects that minimizes total discounted operating and investment costs. Variable operating costs are specified through a general continuous-time function that requires projects to be competitive in a certain sense. This definition for operating costs allows the use of an optimization submodel, such as a multilocation distribution problem, to determine operating decisions. The general formulation includes several simple sequencing problems as special cases. The solution approach afdresses a relaxed problem formulation that incorporates economic criteria for determining project timing decisions, and it is shown that properly defined solution to the relaxed formulation solved the original problem. Several refinements to the basic solution approach are also developed. (Snyder-Calif, Davis)
W79-01561

INVESTMENT PLANNING FOR COLORADO RIVER SALINITY CONTROL,
California Univ., Los Angeles. Graduate School of Management; and California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W79-01587

ON OPTIMAL REGULATION POLICIES FOR CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W79-01731

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst., Oxford.
For primary bibliographic entry see Field 5G.
W79-01741

THE IMPACT OF ENERGY SHORTAGE AND COST ON IRRIGATION FOR THE HIGH PLAINS AND TRANS PECOS REGIONS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 3F.
W79-01894

6B. Evaluation Process

MANAGEMENT OF LOCAL WATER SYSTEMS IN ALABAMA,
Alabama Univ. in Birmingham. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W79-01536

MONTANA'S WATER RESOURCES: A RESEARCH TRUST.
For primary bibliographic entry see Field 6E.
W79-01541

ENERGY RESOURCES DEVELOPMENT IN WYOMING'S POWDER RIVER BASIN: AN ASSESSMENT OF POTENTIAL SOCIAL AND ECONOMIC IMPACTS,
Wyoming Univ., Laramie. Water Resources Research Inst.
R. A. Matson, and J. B. Studer.
Prepared for Northern Great Plains Resources Program by the Wyoming Water Resources Research Institute in cooperation with the Economic Research Service, U.S.D.A., May 1974. xviii + 152 p, 2 fig, 65 tab, 10 ref, 4 append.

Descriptors: *Wyoming, *Population growth, *Economic impact, *Social impact, *Employment, Distribution patterns, Manpower, Industrial production, *Energy development, *Powder River Basin(Wyo), Campbell County(Wyo), Crook County(Wyo), Niobrara County(Wyo), Converse County(Wyo), Johnson County(Wyo), Sheridan County(Wyo), Natrona County(Wyo), Weston County(Wyo).

Development of the coal and uranium reserves of Wyoming's Powder River Basin, which includes 8 counties in the northeast corner of the state, will generate within a decade sharp increases in employment and population, much of it through the in-migration of relatively young, highly paid workers. Projections of population, employment, and settlement patterns to the year 2000 are made, based on four possible scenarios. Three of these (minimal, intermediate, and extensive coal development) were established by the Northern Great Plains Resources Program (NGPRP); the fourth was developed to accommodate Wyoming's Department of Economic Planning and Development data. Included are a survey of existing literature

and current research, development alternatives, impact estimates, implications of each scenario, and a consideration of the need for further research.
W79-01545

SEQUENCING COMPETITIVE EXPANSION PROJECTS,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 6A.
W79-01561

THE STUDY OF ENVIRONMENTAL PUBLIC POLICY: A PRELIMINARY DIRECTORY,
California Univ., Davis. Dept. of Political Science.
G. Wandesforde-Smith.
Human Ecology, Vol. 2, No. 1, 1974, p 45-62. 38 ref. (Univ. of Calif. Water Resources Center Project UCAL-WRC-W337). OWRT B-142-CAL(1).

Descriptors: *Environment, Benefits, Water policy, *Directories(Personnel), Public policy.

Selected contributions to the study of environmental public policy are reviewed in the context of the difficulties faced in making such studies cumulative. The information obtained for a preliminary directory of students of environmental public policy is outlined and briefly analyzed. The directory itself is presented. (Snyder-Calif, Davis)
W79-01569

SUMMER DISTRIBUTION AND REPRODUCTIVE STATUS OF FISH OF THE COLORADO RIVER IN GRAND CANYON NATIONAL PARK AND VICINITY, 1975,
Northern Arizona Univ., Flagstaff. Dept. of Biological Sciences.
C. O. Minckley, and D. W. Blinn.
Final Report No. CRRP-14, June 1976. 17 p, 2 fig, 3 tab, 18 ref. CX821060008.

Descriptors: *Fish populations, *Fish reproduction, *Conservation, *Colorado River, National Parks, Aquatic life, Surveys, Fish types, Ecology, Fish conservation, Bonytail chub, Habitats.

A survey was conducted during the summer of 1975 on the summer distribution and reproductive status of fish in the Colorado River and its tributaries. Ten species were collected, four native and six exotic, and reproduction was verified in all native fish and three exotic species by collection of juvenile forms born that year. All the native fish except the bonytail chub were common varieties and were more abundant in total numbers and localities collected than exotic varieties. However, exotic fish were distributed throughout the system. Although competitive interaction between native and exotic fish generally results in the eventual extirpation of native fauna or a drastic reduction in numbers, it appears that most species of native fish in this area are holding their own and are at levels similar to those of 1968. All fish were examined for ectoparasites and found to be negative. Recommendations are included pertaining to further research and providing information to visitors on endangered species present in the Grand Canyon National Park. (Majtenyi-IPA)
W79-01585

WETLANDS OF THE UNITED STATES: THEIR EXTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
S. P. Shaw, and C. G. Fredine.
Available from the National Technical Information Service, Springfield VA 22161 as PB-273 103, Price codes: A05 in paper copy, A01 in microfiche. Circular 39. 1956. 47 p, 12 fig, 8 tab, 18 ref, 20 plates.

Descriptors: *Wetlands, *Classification, *Marsh management, *Wildlife habitat, Marshes, Swamps, *[illegible], Aquatic habitats, Census, Survey, Evaluation, National Wetland Inventory.

This report describes the use of the marshes, swamps, and overflow lands by wildlife, and points out relative values of different types of wetlands to wild game in general an to waterfowl in particular. It locates and describes areas that should be protected and improved to meet the needs of a stable or increasing water fowl population. The information is presented to help stimulate the establishment of more comprehensive land-use programs and policies. (Steiner-Mass)
W79-01635

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
E. O. Kline, F. Petrusak, and W. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 208, Price codes: A03 in paper copy, A01 in microfiche. South Carolina Sea Grant Technical Report No. SC-SG-77-5, May, 1977. 29 p, 16 tab, 1 append.

Descriptors: *Marshes, *South Carolina, *Attitudes, Wetlands, Surveys, Land use, Swamps, Atlantic Coastal Plain, Decision making.

Survey research conducted in late 1973 and early 1974 was used to ascertain the attitudes of the elite of South Carolina's coastal counties towards marshlands. Included in the 'elite' are politicians, interest group leaders, and other residents involved and interested in the use of the marsh. Elites were knowledgeable about the marshland and were aware of key marsh-related issues. Development and use of marshland should be regulated by the government according to respondents; forty-five percent believe that the government should directly own and control the marshland. Zoning and leasing permits, two instruments of government regulation, were strongly supported. Fifty-five percent of the elite rated conservation and aesthetic use of marshes at first or second priorities for the future; commercial use was given a much lower priority. Among all of the problems confronting the state, however, respondents do not believe preservation and controlled development of the marsh are among the most important. (Stihler-Mass)
W79-01648

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
A. J. Mumphrey, Jr., E. J. Durabb, W. B. McCrocklin, Jr., S. T. Halperia, and S. D. Villavaso.
October, 1975. 232 p.

Descriptors: *Wetlands, *Land use, *Louisiana, *Cities, *Marsh management, Decision-making, Social aspects, Urbanization, Zoning, Developed waters, Land development, Water pollution effects, Economics, Metropolitan wetlands, Wetland development.

Information is gathered from various sources concerning wetlands and their relationships to metropolitan areas and a decision-making framework is presented for wetland development. In chapter one, wetlands are defined and a general description of Louisiana's wetland Standard Metropolitan Statistical Areas (SMSA) are given. The second chapter examines wetland zoning and master land use plan projected wetland development for each SMSA. Chapter three focuses on the impacts of metropolitan development in wetlands in terms of pollution, reclamation, and channelization. A per acre monetary evaluation on the basis of noncompeting wetland component functions and wetland energetics is given in chapter four. Private and public construction and maintenance costs in wetland areas are considered in chapter five. Projections of future metropolitan land space requirement and location of activities are discussed in chapter six. Chapter seven discusses impacts in a framework of development decision making which includes comprehensive costs and benefits, com
munity goals, and distribution effects. Chapte
eight presents a comprehensive planning proce
leading to wetland development or nondevelop
ment and also points out areas of future researc
(Steiner-Mass)
W79-01650

DECISION MAKING IN A MULTIPLE-US APPROACH TO THE RECLAMATION O STRIP-MINED LANDS,
Arizona Univ., Tucson. Dept. of Systems and In
dustrial Engineering; Arizona Univ., Tucso
Dept. of Hydrology and Water Resources; an
Arizona Univ., Tucson. School of Renewable Na
ural Resources.
For primary bibliographic entry see Field 5C
W79-01730

ON OPTIMAL REGULATION POLICIES FO CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W79-01731

WATER SUPPLIES AND COSTS IN RELA TION TO FARM RESOURCE DECISIONS AN PROFITS ON SACRAMENTO VALLE FARMS,
California Univ., Davis. Dept. of Agricultur
Economics.
For primary bibliographic entry see Field 6C.
W79-01737

CONSUMER ATTITUDES TOWARD TAST AND ODOR IN WATER,
California Univ., Berkeley. School of Publ
Health.
W. H. Bruvold.
Journal American Water Works Association, O
tober 1977, p 562-564. (California Water Resourc
Center Project UCAL-WRC-W-359).

Descriptors: *Water quality, *Taste, *Odor, *Att
tudes, Social values, Social perception, Consum
attitudes.

The rationales behind several approaches to inve
tigating consumer perception of taste and odor
water are explored. The analysis suggests that tw
of four categories of taste and odor would b
governed best by limits and two would best b
governed by grades - the major determinant bein
the pleasantness or desirability of just perceptib
concentrations. Consumer-panel research woul
produce better limits as standards. Both types
research need further development and refineme
before a full range of perceptual standards can b
recommended with confidence. Enough progre
has been made in consumer and in threshold r
search to encourage further work on both towar
attaining the best possible perceptual water quali
for all consumers. (Snyder-Calif, Davis)
W79-01739

HOW TO CONDUCT A WASTEWATE SURVEY: PART II - DEVELOPING WAST STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramu
NJ.
For primary bibliographic entry see Field 5C
W79-01760

INTERIM REPORT NO. 2, WABASH RIVE BASIN COMPREHENSIVE STUDY COVERIN RESERVOIR SITES ON EMBARRASS RIVE IL, AND CLIFTY CREEK AND PATOK RIVER, IN, VOL. I: REPORT.
Army Engineer District, Louisville, KY.
Available from the National Technical Informatio
Service, Springfield, VA 22161 as AD-A036 53
Price codes: A06 in paper copy, A01 in microfich
1964, 91 p, 15 tab, 7 plates. See also Vols. II an
III

criptors: *Water resources development, *Mul-
-purpose reservoirs, *Water resources, *Com-
ensive planning, *Reservoirs, Illinois, Indiana,
face waters, Impoundments, Competing uses,
ervoir storage, Water sources, Water supply,
nomics, Projects, Administration, Alternative
ning, Area redevelopment, Flood control,
reation, Water policy, Watersheds(Basins),
t-benefit analysis, Hydrology, Local govern-
ts, Inter-agency cooperation, Fisheries, Water
ity, *Wabash River Basin, *River basin devel-
ent.

interim report is preliminary to the 71 publi-
on of the Wabash River comprehensive plan,
the Wabash River and tributaries in Indiana,
ois and Ohio. Studies on the three reservoir
cts recommended in this plan had progressed
he point where their construction had been
ned desirable and this report was prepared as a
cle for the possible authorization of these pro-
. The report reviews economic development,
eorology and hydrology, water resources prob-
and needs, considered solutions, reservoir
s, cost allocations, local cooperation and inter-
cy coordination. The report proposes devel-
ent of Lincoln Reservoir on Embarrass Creek
llinois, Clifty Creek Reservoir on Indiana's
y Creek and Patoka Reservoir on Patoka
r in Indiana. Each reservoir is multi-pupose,
rding flood control, water-associated recrea-
and providing new fisheries. Additionally,
Lincoln and Patoka Reservoirs would pro-
needed storage for water supply and improve-
t of downstream water quality. For each Proj-
benefits exceed costs with ratios ranging from
to 1.6:1. The projects have been endorsed by
l governments, and public agencies; however,
l individuals and interests whose properties are
lved in land acquisition or damage considera-
generally oppose the projects. (Zayac-NC)
9-01827

**ERIM REPORT NO. 2, WABASH RIVER
IN COMPREHENSIVE STUDY COVERING
ERVOIR SITES ON EMBARRASS RIVER,
AND CLIFTY CREEK AND PATOKA
ER, IN. VOL. II: APPENDICES A-C.**

y Engineer District, Louisville, KY.
ilable from the National Technical Information
ice, Springfield, VA 22161 as AD-A036 532,
e codes: A10 in paper copy, A01 in microfiche.
ary 1964, 207 p. Appendix A: Detailed Esti-
e of First Costs and Annual Costs; Appendix B:
nomic Development and Estimates of Dam-
and Benefits; Appendix C: Cost Allocation
Apportionment. See also Vols. I and III.

criptors: *Water resources development, *Mul-
-purpose reservoirs, *Economics, *Cost allo-
on, *Comprehensive planning, Indiana, Illinois,
ortization, Annual benefits, Cost-benefit analy-
Costs, Cost analysis, Area redevelopment, Em-
ment, Human resources, Labor supply, Recre-
n, Water quality, Water supply, Regional de-
pment, Economic efficiency, Economic
act, Income, Income analysis, Regional eco-
ics, Wages, Annual costs, *Economic develop-
t, *Cost apportionment, *Wabash River, River
n development.

volume is part of the interim report published
r to the 1971 publication of the Wabash River
prehensive plan for the Wabash River and
taries in Indiana, Illinois an Ohio. Three reser-
s are recommended in the interim plan: Lin-
Reservoir on Embarrass Creek, IL; Clifty
k Reservoir and Patoka Reservoir, IN. Ap-
dix A is comprised of two sections: the first is a
iled estimate of first costs and annual costs; the
nd reviews Area Redevelopment Act (ARA)
cts. The first section is a series of tables, with
of the three projects' costs first summarized,
owed by detailed estimates of first costs and
ual costs. The second section reviews labor
s; operation and maintenance costs; population;
loyment and unemployment; and skilled
ker effects resulting from the implementation
RA. Appendix B reviews economic develop-
t and estimates of damages and benefits that
ht result from the construction of the three projects. An economic history of the Wabash River Basin is presented, development differences between the White and Wabash Basins are discussed, population and projected growth and distribution in the Wabash Basin are outlined and development trends reviewed. Appendix C assesses cost allocation and apportionment. The allocation of costs between purposes is explored. Investment costs, annual costs and alternate costs are inventoried. This is followed by the apportionment of costs between federal and non-federal interests in such categories as flood control, water supply, water quality control, fish and wildlife and recreation. (Zayac-NC)
W79-01828

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.

Army Engineer District, Louisville, KY.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 533, Price codes: A99 in paper copy, A01 in microfiche. January 1964, 641 p, Appendix D: Hydrology and Hydraulics; Appendix E: Geology, Soils and Materials; Appendix F: Reports of Other Agencies. See also Vols. I and II.

Descriptors: *Hydrology, *Hydraulics, *Multiple-purpose reservoirs, *Geology, *Comprehensive planning, *Water resources development, Indiana, Illinois, Geohydrologic units, Hydrologic aspects, Hydrologic budget, Hydrologic cycle, Hydrologic data, Permeability, Drainage, Flood control, Limnology, Precipitation(Atmospheric), Runoff, Spillway gates, Streamflow, Watersheds(Basins), Engineering geology, Geologic foundations, Geomorphology, Topography, Sedimentation, Recreation, *Wabash River, *Embarrass River(IL), River basin development.

This volume is part of the interim report published prior to the 1971 publication of the Wabash River comprehensive plan for the Wabash River and tributaries in Indiana, Illinois and Ohio. Three reservoirs are recommended in the interim plan: Lincoln Reservoir on Embarrass Creek, IL.: Clifty Creek Reservoir and Patoka Reservoir, IN. Appendix D Surveys the hydrology and hydraulics of each site both before and after the expected construction of each project. Included are flow data at the dam sites, unit hydrographs at selected points on the rivers to be impounded, tailwater rating curves, area and capactiy of the reservoirs, standard project storms and floods, plans for water supply and water quality storage, flood control and regulation, engineering reviews of outlet works and spillways, runoff data and frequency curves outlining natural discharge, natural stages and modified stages. Appendix E reviews the geology, soils and materials of each of the three projects. Features of each site are discussed: physiography, regional geology, bedrock structures, groundwater conditions, foundation explorations, and conditions of preliminary and final site selection, embankments and sources of construction materials. Appendix F is comprised of 10 reports from other agencies. Agencies submitting reports are U.S. Dept. of Agriculture Soil Conservation Service and Forest Service; U.S. Dept. of Interior Geological Survey, Fish and Wildlife Service, Bureau of Outdoor Recreation, Bureau of Mines; U.S. Dept. of Health, Education and Welfare Public Health Service; the Federal Power Commission; City of Charleston, IL.; and Indiana Flood Control and Water Resources Commission. These include groundwater appraisals, geological maps, reports on recreation resources and fish and wildfife resources and water resources and water resources study for the various reservoir projects. (Zayac-NC)
W79-01829

WABASH RIVER BASIN COMPREHENSIVE STUDY. VOL I. MAIN REPORT,

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 536, Prepared by U.S. Army Corps of Engineers, Louisville District, for Wabash River Coordinating Committee, (Ill-Ind-Ohio), 1971, 266 p, 97 tab, 128 fig, 2 attachments.

Descriptors: *Water resources development, *Water resources, *Planning, *Comprehensive planning, Illinois, Indiana, Ohio, Water reuse, Water policy, Water quality, Monitoring, Natural resources, Land resources, Water rights, Economic, Regional analysis, Social impact, Environmental impact, Geology, Topography, Physiographic provinces, Climate, Hydrology, Water supply, Navigation, Programs, Flood control, Ground water availability, *Wabash River Basin planning.

The Objective of this study is to identify, evaluate and propose a water and land resource plan for the Wabash River and its tributaries in Indiana, Illinois and Ohio. Four basic planning elements--economic, regional, environmental and social--are addressed in the study in order to accommodate the best balance of interests in a solution to the water problems and needs of the people of the Wabash River Basin. In this main report, physical characteristics of the basin are described, including geology, physiography, topography, land resources, climate, hydrology and environmental features. The economic environment is discussed in terms of current economic patterns and activities and the projected economy. The status of water and related land resources availability, development, programs and planning are assessd. Problems and needs in flood control, water supply, electric power, water quality, environmental resources and navigation are studied. A background to the formulation of the comprehensive plan is provided, followed by a description of the comprehensive plan. Here, the plan is first described in general terms. Then each plan feature and its short- and long-run implications are scrutinized. Lastly, effects for each subbasin are reviewed. A summary evaluation conducted for each problem (or need) outlined above. Implementation is discussed, followed by conclusions and specific recommendations for water quality, ground water use, water reuse and water quality monitoring. Policy and legislative suggestions are provided and recommendations for plan implementation are outlined. (Zayac-NC)
W79-01830

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,

Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W79-01833

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,

Abt Associates Inc., Cambridge, MA.
For primary bibliographic entry see Field 3F.
W79-01836

A LAND STUDY FOR DOWNTOWN LAKE CHARLES,

Houston Univ., TX. Coll. of Architecture.
B. C. Webb, D. Herring, and J. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 477, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Lake Charles-McNeese Urban Observatory, Inc., Lake Charles, LA, Spring 1977, 21 p.

Descriptors: *Urban land use, *Architecture, *Urban planning, *Planning, Recreation, Community development, Land development, *Lake Charles(LA), Commercial structures, Public amenities, Infrasture.

This study investigates the factors that will help determine the most appropriate use and development pattern for a section of publicly-owned waterfront property located within the city of Lake Charles, LA. The factors include the morphological features of the city, activity patterns, and an assessment of the city's building process. The report explores the use potential of the site in terms of the related activity patterns in the area as well

as structuring concepts for integrating site development with the existing city fabric and effective use of the attractive site features. The present tract is undeveloped except for a narrow band of landscaping adjacent to the Lake Shore Highway, a major thoroughfare running along the edge of the site. The site is well located in relation to the major activity centers of the central city, with good visibility and access from entry roads, and is located close to a major civic center. The report offers several different uses for the site and evaluates these uses in terms of overall compatibility within the city's context. The three general land use concepts discussed are a waterfront park, uses related to the Civic Center and uses related to the tourist traffic. The major conclusion of the report is that the infrastructure should be built first, followed by the development of the public amenities and facilities, and lastly, the building of commercial structures. The development plan should be flexible enough to provide for changing circumstances. (Coan-NC)
W79-01838

THE UPPER COLUMBIA NAVIGATION PROPOSAL.
Cornell, Howland, Hayes and Merryfield, Bellevue, WA.
For primary bibliographic entry see Field 4A.
W79-01843

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
Sponsored by NOAA, Office of Coastal Zone Management, Washington, D.C., September 1976, 102 p, 3 append.

Descriptors: Water resources, *Coasts, *Illinois, *Management, Planning, Political aspects, *Lake Michigan(IL), *Coastal Zone Management, *Public participation, Resources management.

This report is a compilation of second-year citizen participation activities and their influence on the Illinois Coastal Zone Management Program for Lake Michigan. The three organizations responsible for involving the public in the planning process were: the Lake Michigan Inter-League Group of the League of Women Voters (LWV); the Northeastern Illinois Planning Commission; and the Lake Michigan Federation. Included in the activities sponsored by the League of Women Voters are descriptions of each of the 12 public education and input meetings scheduled by local Leagues, the publicity developed by each of these Leagues, the methodology used at each meeting, and the results of the citizen comments elicited at each meeting. Also included are explanation of the rationale and procedures involved in the distribution of packets of information to area libraries prior to each scheduled meeting. The Northeastern Illinois Planning Commission's function was to facilitate communication between the public and officials in the Coastal Zone Management Program. Their activities included conducting a training session for all public meeting facilitators; preparing three identical library displays keyed to LWV-sponsored public meetings; and providing the staff evaluation and consultation on group interaction methods for effective participation. Descriptions of the Lake Michigan Federation activities included their public workshops on Coastal Zone Management, publishing of a report (Lake Michigan Current), and monitoring staff and citizen attitudes about the Program. Each organization has provided an analysis of the success of their undertakings. (Coan-NC)
W79-01845

COMPREHENSIVE WATER QUALITY MANAGEMENT FOR THE STATE OF SOUTH DAKOTA. 303(E) BASIN PLAN FOR THE MINNESOTA RIVER BASIN.
South Dakota Dept. of Environmental Protection, Pierre.
For primary bibliographic entry see Field 5G.
W79-01846

SYSTEMATIC DEVELOPMENT OF INSTITUTIONAL AND LEGAL PRESCRIPTIONS FOR URBAN WATER USE AND MANAGEMENT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W79-01891

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

FACTORS AFFECTING THE USE OF AN ARTIFICIAL BEACH: A CASE STUDY ON MISSISSIPPI GULF COAST,
University of Southern Mississippi, Hattiesburg. School of Business Administrations.
C. P. Cartee, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 393, Price codes: A04 in paper copy, A01 in microfiche. Report, October 1978. 59 p, 2 fig, 16 tab, 16 ref. OWRT A-109-MISS(1). 14-34-0001-8026.

Descriptors: *Beaches, *Recreation standards, *Recreation demand, *Artificial beaches, Harrison County(Miss), *Mississippi, Pass Christian(Miss), Long Beach(Miss), Gulfport(Miss), Biloxi(Miss).

The purpose was to provide basic data relative to the utilization of the 26-mile, man-made beach in Harrison County, Mississippi, and to determine factors related to beach use. More specifically, the project was purposed with quantifying the level of beach usage by delineated zones at selected periods of the year; determining the characteristics of users and factors prohibiting or encouraging their use of the beach; appraising consumer perception of water quality and its relationship to beach usage; and reviewing the various legal, political and jurisdictional factors affecting the future development and use of the resource. Procedures involved random counts of beach usage by delineated zones and personal interviews with beach users. Marked variations were found in beach usage among zones and periods of the year. In terms of carrying capacity criteria the beach was well below its potential. A significant difference was found between resident and non-resident perceptions of beach water quality while no significant difference was found in activity usage of the beach between the two groups. Lack of public conveniences on or contiguous to the beach was noted by the two groups. Lack of public conveniences on or contiguous to the beach was noted by the two groups. Lack of public conveniences on or contiguous to the beach was noted by interviewees most often as factors detracting from their beach recreational experience.
W79-01979

REMOTE SENSING ASSESSMENT OF DAM FLOODING HAZARDS: METHODOLOGY DEVELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4A.
W79-01980

AN UNOBTRUSIVE MEASURE OF THE RECREATIONAL VALUE OF A LAKE,
Augusta Coll., GA.
W. D. Spears, and R. R. Criss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 363, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Institute Bulletin 27. Auburn University, Alabama, April 1977. 16 p, 2 fig, 2 tab. OWRT B-037-ALA(2).

Descriptors: *Lakes, *Recreation, Socio-economic value, *Alabama, *Social value, *Social participation, Measurement.

Data from a study of an Alabama lake was used to demonstrate that separate measures of rated values of a facility for various recreational activities, and reports of participation in those activities, are functionally related to a high degree. A simple unobtrusive measure, obtainable by a 'nose count' by an observer or from daily records maintained in some facilities, may provide the equivalent of information regarding one kind of social value usually obtained by unwieldly questionnaires. The measures developed in this study may well overcome a crucial problem present in questionnaire studies. What can be concluded if the percent of respondents is low. This study concluded that percents of participants engaged in various activities can validly indicate perceived worth of the site for those activities. Careful accounting would require original calibration of the percentage measure against a scale of value, but once obtained, non-obtrusive measures would permit monitoring of recreational value of a site as it changed with conditions, expenditures, etc.
W79-01986

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-01544

WATER SUPPLIES AND COSTS IN RELATION TO FARM RESOURCE DECISIONS AND PROFITS ON SACRAMENTO VALLEY FARMS,
California Univ., Davis. Dept. of Agricultural Economics.
T. R. Hedges.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 688. Price codes: A06 in paper copy, A01 in microfiche. Giannini Foundation Research Report No. 322, June, 1977. 90 p, 12 fig, 14 tab, 37 ref, append. (California Water Resources Center Project UCAL-WRC-W-111). OWRT B-008-CAL(3) and B-068-CAL(2).

Descriptors: *Economics, *Water requirements, *Decision making, Management, Groundwater, Water management(Applied), Resource allocations, Model studies, *Crop production, *Tomatoes, *Sacramento Valley(Calif), Irrigation water use, Water supply, *Cost analysis, California.

This summary of research on two 640-acre general-crop farm models in the Southern Sacramento Valleys, Yolo County, examines the economic impacts of variations in water quantities and costs on farm profits. This second study (see also W74-11568) in the Sacramento Valley irrigation economics series considers two analysis models: The high productivity soils unit includes Storie Index Grades I and II soils; the soils for the medium productivity unit are predominantly Storie Index Grade III, but range into Grade IV. Maximum potential water quantities available for the analysis models in this study total nearly 2,800 acre-feet, according to the number of wells and their potential pumping capacity. Water prices were approximately $2.50 to $3.00 per acre-foot, depending on quantities pumped, for variable expenses only, or a total of about $7.00 to $9.00 per acre-foot for variable expenses and fixed costs combined. The study analyzed three general crop irrigation practices: (1) reirrigating when the depletion percentage for available soil moisture reaches 60 percent--'wet'; (2) reirrigating at the 80 percent depletion

vel--'medium'; and (3) reirrigating at the 100 per-
nt depletion level--'dry'. Canning tomatoes lead
e crops in amount of net returns under all three
igation practices, with sugar beets and alfalfa
y following in that order. A series of linear
ogramming analyses within the framework of 22
nstraints evaluated the potential effects of water
antities, water prices, and tomato prices on total
m net returns. A linear program analysis deter-
ned the impact on crop choices and land alloca-
ns for these two analysis units as water costs rise
m zero price to over $20.00 per acre-foot. These
alyses also indicate that farmers on the better
ils can profit by expanding water use faster as
ices drop, as compared with operators on the
edium soil.
79-01737

TERIM REPORT NO. 2, WABASH RIVER
ASIN COMPREHENSIVE STUDY COVERING
ESERVOIR SITES ON EMBARRASS RIVER,
, AND CLIFTY CREEK AND PATOKA
VER, IN. VOL. II: APPENDICES A-C.
my Engineer District, Louisville, KY.
r primary bibliographic entry see Field 6B.
79-01828

OST REPORT ON NON-STRUCTURAL
LOOD DAMAGE REDUCTION MEASURES
OR RESIDENTIAL BUILDINGS WITHIN
HE BALTIMORE DISTRICT,
my Engineer District, Baltimore, MD.
r primary bibliographic entry see Field 6F.
79-01832

HE UPPER COLUMBIA NAVIGATION PRO-
OSAL.
rnell, Howland, Hayes and Merryfield, Belle-
e, WA.
r primary bibliographic entry see Field 4A.
79-01843

HE IMPACT OF ENERGY SHORTAGE AND
OST ON IRRIGATION FOR THE HIGH
LAINS AND TRANS PECOS REGIONS OF
EXAS,
xas A and M Univ., College Station. Dept. of
gricultural Economics and Rural Sociology.
r primary bibliographic entry see Field 3F.
79-01894

ATER CONSERVATION IN THE LAS VEGAS
ALLEY: PRICING AND ALTERNATIVE
EASURES,
vada Univ. System, Reno. Water Resources
nter.
r primary bibliographic entry see Field 3D.
79-01896

D. Water Demand

ATER RESOURCES APPRAISAL FOR HY-
ROELECTRIC LICENSING, KERN RIVER
ASIN, CALIFORNIA.
deral Power Commission, Washington, DC.
reau of Power.
r primary bibliographic entry see Field 8C.
79-01835

ATER CONSERVATION IN THE LAS VEGAS
ALLEY: PRICING AND ALTERNATIVE
EASURES,
vada Univ. System, Reno. Water Resources
nter.
r primary bibliographic entry see Field 3D.
79-01896

HE ROLES OF WATER CONSERVATION
ALUES IN COMMUNITY POLICY,
lorado State Univ., Fort Collins.
r primary bibliographic entry see Field 3D.
79-01987

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01991

6E. Water Law and Institutions

UNITED STATES PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL PROGRAM 1975-.
National Committee for the International Hydrological Decade, Washington, DC.
For primary bibliographic entry see Field 2A.
W79-01509

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 4D.
W79-01523

MANAGEMENT OF LOCAL WATER SYSTEMS IN ALABAMA,
Alabama Univ. in Birmingham. Dept. of Political Science.
W. M. Kimmelman, W. J. Duncan, and H. H. Tsang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 222, Price codes: A05 in paper copy, A01 in microfiche. Alabama Water Resources Research Institute Bulletin 34, Auburn University, September 1978. 111 p, 23 tab, 6 fig. OWRT A-050-ALA(1) and B-071-ALA(1).

Descriptors: *Water systems, *Political aspects, Economics, *Management, *Water supply, *Alabama, Water policy, *State water agencies(Alabama).

Part 1 of this report is a study of two public water systems in Calhoun and Cleburne Counties, Alabama. The focus is on major political and economic dimensions that play a key role in the management of water systems in Alabama. The study reveals that the problem of water management is less one of overall supply than the lack of necessary political-economic organizations in getting water from where it is to where it is needed. Part 2, Some Political and Economic Aspects of Water Agencies in Alabama, is an outgrowth of Part 1. While concentrating on local public water systems which provide direct water services, the study also considers how state agencies established to coordinate, regulate and influence water use can facilitate or inhibit the performance of local public water supply systems. (Cooper-Alabama)
W79-01536

MONTANA'S WATER RESOURCES: A RESEARCH TRUST.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 227, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Bozeman, Progress Report, March 1978. 34 p. OWRT A-999-MONT(2). 14-34-0001-7055.

Descriptors: *Progress report, *Montana, Research and development, Legal aspects, *Water Resources Institutes.

The Montana University Joint Water Resources Research Center was established by action of the Board of Regents of the Montana University System on December 8, 1964, under the terms of the Water Resources Research Act of 1964 (Public Law 88-379). The 1975-77 programs of the Center provided funding/administration for twenty allotment, three matching grant, two Title II, and three regional cooperative projects. The projects, which deal with such diverse topics as water quality; economics, social, and institutional studies; mining impacts; saline seep; water resources; land use; wastewater treatment; irrigation effects; and soils-water relationships, are described briefly. Research results have contributed to the control of saline seep, maintaining and improving water quality, analysis and discussion of economic and social issues related to coal-water-energy development in the Yellowstone River Basin, and conservation of precipitation (snow). In addition, the Center has worked closely with state and federal agencies, the Pacific Northwest and Missouri River Basin Commissions, and other institutes in the region; sponsored annual research review conferences; and provided financial support for both undergraduate and graduate students at the three participating University System units. A list of 58 available project completion reports is included. (Hoffman-Montana)
W79-01541

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
December, 1977. 19 p, 3 tab, 8 ref.

Descriptors: *Wetlands, *Massachusetts, *Legislation, *Regulation, Water law, Legal aspects, Permits, Water permits, Water rights, Public rights, Administrative decisions, Marsh management, *Cape Cod, *Wetland Protection Act(Massachusetts), Orders of Conditions.

Assistance in the implementation of the Massachusetts Wetland Protection Act is provided for the Cape Cod area. Orders of Conditions issued by the 15 Cape towns' conservation commissions have been surveyed in order that the projects involved could be categorized and the disposition of Orders which have been appealed could be followed. In addition, copies of the Coastal and Inland Wetland Acts are provided in the appendix. (Steiner-Mass)
W79-01631

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
For primary bibliographic entry see Field 6B.
W79-01648

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,
Abt Associates Inc., Cambridge, MA.
For primary bibliographic entry see Field 3F.
W79-01836

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN. REGION VIII. COLORADO, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, UTAH, WYOMING.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-01842

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 6B.
W79-01845

INNOVATIVE MANAGEMENT CONCEPT FOR 208 PLANNING,
Michigan Univ., Ann Arbor. Civil Engineering and Natural Resources.
For primary bibliographic entry see Field 5G.
W79-01848

SYSTEMATIC DEVELOPMENT OF INSTITUTIONAL AND LEGAL PRESCRIPTIONS FOR URBAN WATER USE AND MANAGEMENT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
J. P. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 488, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 81. August 1978. 74 p, 192 ref, 1 append. OWRT B-058-IND(1).

Descriptors: *Legal aspects, *Water law, *Water policy, *City planning, *Legislation, Administration, Common law, Water resources development, Riparian rights, Water resources planning, Water management, Urban regional development, Management, Water allocation, Institutions, *Indiana, Statutes, Urban water resources.

Indiana public policy concerning the development and regulation of water resources is surveyed. Existing case law on water use is scant, and adjudicated controversies deal with disputes between individual parties rather than the formation of broad resource use policies. The judiciary does not have the opportunity to do the planning and management necessary to assure adequate water supplies and water quality control for the state of Indiana. Since the legislative branch bears the primary responsibility for statewide, long range planning, Indiana statuatory law concerning water resource management is closely scrutinized in terms of both breadth and efficacy. The relationships between federal, state, and local government agencies in providing for adequate water resource management are also examined. Common law theories on water resource management are then reviewed in reference to the rights of riparian land owners as opposed to the rights of drainage basin occupants. Traditional common law theories are then applied to considerations relevant to the choice between surface water and ground water as a primary source of supply. Finally, the Highland Reservoir proposal and other specific municipal planning activity is evaluated in reference to data gathered in a 1972 survey of water resources in Indiana.
W79-01891

KARSTIC INSTITUTIONAL CONFLICTS AND OPPORTUNITIES,
Appalachian Regional Commission, Washington, DC. Energy, Environment and Natural Resources Div.
H. B. Montgomery.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 19-31, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Karst, *Planning, *Regional development, *Institutions, Subsidence, Appalachian mountain region, Limestones, Research and development, Land use, Research priorities, Governments, Administrative agencies.

The science and engineering of geology can address the problems arising from a growing population's consuming patterns. The consumption can result figuratively in a diminishing world and literally in resource dispersion, which, in effect, is the dilution of high quality natural resources and prime terrain, thereby diminishing their economic availability. The management of growth, known as development, is particularly effective when priorities for investment actions are conceived from multi-program and regional perspectives. When proceeding with reference to the resultant planned overview, a reduction can be achieved in the incidence of adverse conflicts arising from interactions between populations and their environments. If geological wisdom is to provide the maximum help to reducing those conflicts, then geo-specialists must extend themselves beyond their specialty to participate in the decision-making processes socity has designed for institutions to discipline themselves, including the related public participation procedures. Geographic, economic, ecological, environmental, and social impacts from karstic events are part of a broader perception concerning the consequences of undermining the earth's surface. Coal mining, mine roof collapse and surface ground subsidence are comparable to the collapsing of limestone solution cavities. Similarly, many coal mining area communities face post-mining collapse hazards to health, safety, property, general well-being, and quality of life. As national energy needs are satisfied, there will be further threats to community security from mine subsidence events. Experience in addressing current and future community problems caused by coal mine subsidence can assist the development of approaches to resolving unacceptable conditions in karstic terrains. (See also W79-01932) (Humphreys-ISWS)
W79-01935

EARLY CONFLICTS OVER EFFLUENT IRRIGATION IN MISSOURI'S OZARKS,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
C. D. Settergren.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 405-410, 1977. 1 fig, 2 ref.

Descriptors: *Waste water disposal, *Water pollution, *Irrigation, *Missouri, Karst, Effluents, Water pollution sources, Groundwater, Jurisdiction, Federal jurisdiction, State jurisdiction, *Missouri Ozarks, Agency conflicts.

Irrigation land disposal of sewage effluent in the Karst Ozarks has been challenged vigorously. There has been a growing concern that the quality of a number of Missouri's spring-fed Ozark streams has become jeopardized by the discharge of wastewater from various sources. In 1973, in an effort to protect selected endangered waterways, Missouri's Clean Water Commission banned all direct discharge. Effluent irrigation was virtually the only state-sanctioned disposal alternative open. Unfortunately for a number of small municipalities and others seeking to comply with the new regulations, the EPA, which must approve all requests for federal planning and construction grants, declared that effluent irrigation is contra-indicated for the Ozarks. The EPA and others contended that the disposal of treated sewage on the karst landscape would endanger the vulnerable groundwater supplies. Others felt that, with the careful selection of an irrigation site and proper system design, effluent renovation could be achieved safely prior to percolation to groundwater. Although early in 1975 the Clean Water Commission provided a way around the dilemma by redefining 'no discharge' to allow for the limited release of secondary treated effluent, there continues to be an information moratorium on effluent irrigation systems in Missouri's Karst Ozarks. (See also W79-01932) (Humphreys-ISWS)
W79-01971

6F. Nonstructural Alternatives

COST REPORT ON NON-STRUCTURAL FLOOD DAMAGE REDUCTION MEASURES FOR RESIDENTIAL BUILDINGS WITHIN THE BALTIMORE DISTRICT,
Army Engineer District, Baltimore, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 013, Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, VA, July 1977, p. 135, 4 append.

Descriptors: *Flood protection, *Floodproofing, *Building codes, *Non-structural alternatives, Construction costs, Relocation, Urban renewal, Planning, Flood damage, Cost estimates, *Baltimore,(MD), *Flood damage reduction, Methodology, Residential buildings.

This report provides cost estimates, structural analysis, and real estate policy guidelines for reducing flood damage via non-structural methods. The 5 non-structural measures include: acquisition and demolition of the existing flood-prone structure; relocation of the flood-prone structure outside the flood plain; relocation of household mechanical and electrical equipment to an area that is not subject to flooding; raising the first floor of a flood-prone structure; and floodproofing the basement against infiltration. Commercial and industrial establishments are outside the intended scope of this report. Cost estimates are for four locations in Baltimore. The report provides an introduction to the purpose and design of the cost analysis of each method, the various assumptions and considerations relating to the evaluation of each measure, the results of the cost analysis for each method and combination of methods, and a general discussion on the applicability of each non-structural measure given a water surface location. This report can be utilized by planners, homeowners, and local officials trying to reduce or eliminate flood damages to residential structures by using nonstructural approaches. (Coan-NC)
W79-01832

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
W. K. Johnson.
Prepared for Army Corps of Engineers, Ft. Belvoir, VA, Institute for Water Resources. March 1978, 95 p, 3 append.

Descriptors: *Flood plain zoning, *Land use, *Planning, *Flood insurance, *Nonstructural alternative, *Economic feasibility, Zoning, Flood forecast, Flood warning, Flood control, Costs, Project feasibility, Flood protection, *Flood plain management, Sensitivity analysis.

The purpose of this study is to examine the physical and economic feasibility of a number of nonstructural flood control measures and develop criteria for their use. Eleven such measures are selected; this report evaluates their overall physical and economic feasibility. The measures studied are: temporary and permanent closures for openings in existing structures; raising existing structures; construction of new structures on fill or columns; small walls or levees around structures; relocating or protecting damageable property; relocating existing structures and/or contents out of a flood hazard area; flood forecast, warning and evacuation; use of water resistant materials in construction; regulation of development of flood plain land through zoning ordinances, subdivision regulations and building codes; public acquisition of title or easement to flood plain land; and flood insurance. Cost estimtes, advantages, disadvantages and references are provided for each measure. A sensitivity analysis of flood damage in relation to various hydrologic, hydraulic, and economic parmeters was conducted. These parameters include elvation-frequency relationship, frequency 'skew,' depth-damage relationship, value of structure contents as a percentage of the value of a structure, type of structure, and location in the floodplain. The effectiveness of selected nonstructural measures was then evaluated by computing the damage reduced for several levels of protection. It was found that nonstructural measures have an important role alongside structural measures in reducing flood losses. Every measure investigated was found to be physically and economically feasible in some flood hazard situation, and particular applications and limitations were identified. (Coan-NC)
W79-01833

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILL-

WATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W79-01852

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH, JUNIATA RIVER, CLAYSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01853

FLOOD PLAIN INFORMATION: MUDDY BRANCH, MONTGOMERY COUNTY MARYLAND.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01856

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK, PROVO, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 4A.
W79-01859

6G. Ecologic Impact Of Water Development

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
T. J. McClellan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 657, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-OR-74-1, 1974. 98 p, 9 ref, 4 append.

Descriptors: *Fish populations, *Wildlife habitats, Construction, *Oregon, *Channel morphology, Channel improvement, Ecology, Fish migration, Spawning, Bank protection, Embankments, River beds, On-site investigations.

A field investigation of 18 highway-related, stream channel changes in Oregon was made in 1973 to evaluate the effectiveness of natural processes in restoring conditions favorable to use as habitat of the altered streams by fish and of streamside areas by small game. Known conditions prior to channelization, the channel design, construction methods followed, and any measures taken to mitigate harm to the ecology of the stream were used as a basis for comparing the local effects of the various types of alteration. Design features found to be significantly damaging to the stream fishery or to wildlife were discussed in the report. Some measures to prevent or alleviate similar damage by future highway construction were suggested. An appendix presented the findings of a preliminary review of pertinent literature and the detailed case study made in 1972 of a representative stream alteration. (Adams-ISWS)
W79-01515

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
F. Stearns, and D. Lindsley.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL-ES-40 Vol. 11, Price codes: A05 in paper copy, A01 in microfiche. Argonne National Laboratory, Illinois, Publication No. ANL/ES-40, Vol. 11, September 1977. 90 p, 1 fig, 6 tab, 72 ref. W-31-109-Eng-38.

Descriptors: *Lake Michigan basin, *Endangered species, *Threatened species, *Natural areas, *Plant populations, *Animal populations, *Natural resources, Great Lakes, Lakes, Watersheds(Basins), Biological communities, Ecology, Ecosystems, Habitats, Michigan, Illinois, Wisconsin, Indiana, Preservation, Baseline studies, Beaches, Forests, Dunes, Prairies, Wetlands, Birds, Mammals, Reptiles, Amphibians, Fish.

This report: (1) enumerates and describes 139 designated natural areas in the Lake Michigan drainage basin--46 in Wisconsin, 45 in Michigan, 37 in Indiana, and 11 in Illinois; (2) lists endangered and threatened plants and animals in the basin; and (3) identifies critical natural communities in the basin. 'Natural area' is a tract of land which has retained its natural character or has regained it after disturbance; it may include significant geological, archaeological, or scenic features, support a highly diverse or unique fauna or flora, or illustrate ecological principles well. Nature preserves are scientifically, educationally, or culturally valuable, and provide aesthetic, practical, and long-range socioeconomic benefits. Federal and state legislation on endangered and threatened species is reviewed, and annotated lists for the basin are provided. Endangered species include five mammals, six birds, four reptiles, nine fishes, and 10 plants, and threatened species include five mammals (plus 23 additional species), 15 birds, eight reptiles, 10 fishes, four amphibians, and 25 plants. Habitat degradation and destruction is though the most important factor threatening particular species; elimination of certain plant communities would lead to loss of many plant and animal species in the basin, or even extinction. Such communities are located in or on: (1) beaches and sand dunes, (2) prairies, (3) southern mesic forests, (4) wetlands, and (5) natural flowing springs. (Lynch-Wisconsin)
W79-01555

THE STUDY OF ENVIRONMENTAL PUBLIC POLICY: A PRELIMINARY DIRECTORY,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-01569

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
C. B. Sinclair, and R. L. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 236, Price codes: A04 in paper copy, A01 in microfiche. Technical completion report (No. 60), 1978. 45 p, 4 fig, 1 tab, 36 ref. Appendices available upon request from Center. OWRT A-012-ARK(1).

Descriptors: *Ecological surveys, Reservoirs, *Arkansas, *Dardanelle Reservoir(Ark), Nuclear power plants, Plankton, Benthos, Sampling, Zooplankton, Diatoms, Phytoplankton, Crustaceans.

A preliminary ecological survey of Dardanelle Reservoir during the construction phase of Ark. Power and Light Company's nuclear generating facility was conducted from Jan. 1970 - June 1974. The reservoir is characterized by relatively shallow depths and a high flow-thru rate. The reservoir carried a great deal of suspended materials and exhibited high turbidities throughout most of the year. Typical thermal stratification and oxygen depletion were only rarely observed. Many of the physico-chemical parameters exhibited relatively high values in comparison to other Arkansas lakes and reservoirs, but due to absence of prolonged periods of stratification, they did not undergo the extreme fluctuations sometimes observed in other reservoirs. Plankton and benthic samples were collected at least nine times per year from 10 stations. There were a great variety of forms in the phytoplankton with the diatoms making up a considerable portion. The level of turbidity appeared to dampen somewhat the extreme fluctuations sometimes found in 'bloom' periods. In the zooplankton the rotifers Brachionus, Keratella, and Polyarthra predominated followed by the microcrustaceans Cyclops and Bosmina. Both the plankton and benthic fauna showed great seasonal variation. The benthic fauna consistred primarily of Chironomidae, Oligochaeta, and Hexagenia with the Chronomidae predominating in the shallower depths and the Oligochaeta exhibiting increased abundance and importance in the deeper stations.
W79-01591

A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 5C.
W79-01643

PRESERVING THE HERITAGE OF GASPARILLA ISLAND, AN APPROACH TO CONSERVATION OF THE ECONOMIC, CULTURAL, HISTORICAL, AND NATURAL RESOURCES OF THE ISLAND,
Conservation Foundation, Washington, DC.
J. Clark.
1978. 41 p, 12 fig, 6 tab, 10 ref.

Descriptors: *Survey, *Natural resources, *Islands, *Florida, Wetlands, Beach, Dunes, Mangrove swamps, Development, Conservation, *Gasparilla Island(Fla).

This report is a reconnaissance survey of Gasparilla Island resources with some general considerations for their conservation. The major subsystems, or ecological zones, are: beaches and dunes, hammocks and savannahs, wetlands and interior waters, and mangroves and estuarine waters. Each of these is discussed according to their different environmental functions, values, and suitabilities for development. (Steiner-Mass)
W79-01646

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4C.
W79-01651

IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: RE-

FORMING THE IMPACT ASSESSMENT PROCESS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
J. K. Mitchell.
Coastal Zone Management Journal, Vol 4, No 3, p 299-327, 1978. 1 tab, 72 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Environmental effects, Coasts, Gas, Resources development, Management, *Outer Continental Shelf, Petroleum development, Environmental impact statements, Onshore impacts.

In an otherwise complex regulatory system, the federal Environmental Impact Statement process affords loca decision makers and coastal zone residents a rare opportunity to analyze the comprehensive range of land-use and environmenta issues that may arise from Offshore Continental Shelf (OCS) hydrocarbon development, while there is still time to formulate effective management strategies. As exemplified by the lease sale 40 statement, present onshore impact assessment procedures are sufficiently flawed to seriously compromise this goal. Critical deficiencies include failure to emphasize onshore impacts; insensitivity to spatial variations of impact; neglect of available data; rigid, unsupported assumptions; and preoccupation with short-term effects to the exclusion of more significant and dependent long-term consequences. Suggested reforms include preparation of separate exploration and development impact statements; establishment of special Council on Environmental Quality review procedures; modification of the judicial review process; and provision of additional support to local onshore OCS impact areas. (Sinha-OEIS)
W79-01783

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
For primary bibliographic entry see Field 5C.
W79-01787

AN OVERVIEW OF NOAA'S ENERGY RESOURCES PROJECT ON FATE AND EFFECTS OF CONTAMINANTS IN MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W79-01805

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
For primary bibliographic entry see Field 5C.
W79-01811

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01818

DEMERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM CAPE SPENCER TO UNIMAK PASS 1948 - 1976. A HISTORICAL REVIEW. VOLUME 3,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W79-01821

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01822

COMMUNITY STRUCTURE, DISTRIBUTION, AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5C.
W79-01823

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01840

ENVIRONMENTAL ASSESSMENT OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-01844

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

7. RESOURCES DATA

7A. Network Design

A PRELIMINARY INVESTIGATION ON SEISMIC TECHNIQUES USED TO LOCATE CAVITIES IN KARST TERRAINS,
Chester Engineers, Inc., Coraopolis, PA. Geotechnical Dept.
For primary bibliographic entry see Field 2F.
W79-01940

THE A, B, C'S OF FINDING AND DELINEATING CAVES WITH APPARENT RESISTIVITY MEASUREMENTS,
Monongahela National Forest, Elkins, WV.
For primary bibliographic entry see Field 2F.
W79-01941

7B. Data Acquisition

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 4A.
W79-01510

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
H. L. McKim, L. W. Gatto, C. J. Merry, B. E. Brockett, and M. A. Bilello.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 500, Price codes: A04 in paper copy, A01 in microfiche. CRREL Special Report 76-13, November 1976, 53 p, 21 fig, 5 tab, 11 ref, 3 append.

Descriptors: *Remote sensing, *Satellite(Artificial), *Montana, *Data transmission, *Lake morphology, Ice cover, Snowpacks, Water quality, Eutrophication, Telemetry, Stratification, Circulation, *Kootenai River(Mont).

This investigation (1) compiled and analyzed climatic data for the past 10 years from all available weather observing stations in the East Kootenai River Basin, (2) analyzed changes in ice and snow cover, and turbidity and plankton blooms on Lake Koocanusa, (3) assessed the present limnology of Lake Koocanusa and the potential for water quality problems, especially eutrophication, and (4) demonstrated the reliability of the LANDSAT Data Collection Platform (DCP)-Martek Water Quality Monitor system for acquisition of data from a remote site. Results indicated that the Kootenay region is about twice as cold as the Libby region in winter, and that reservoir ice first forms along the shore in the northern region in lake November and in the southern part in mid-December, with total freeze-over usually occurring 2 to 4 weeks later. Ice break-up in the northern sections usually occurs 1-3 weeks later than in southern areas; average annual snowfall is 42 to 144 inches, with ice thickness and snowfall varying with relief. Variations in areal distribution of snow within the basin and ice cover on the reservoir were observable for periods from January to October 1973. Reservoir turbidity was observed to increase south of Ellsworth and Stenerson Mountains. Low algal productivity observed was due to the algae being circulated most of the time below the depth of 1% light to high turbidity. The DCP-Martek system operated well, and reliable data were received while the system was located in the pool above Libby Dam and downstream below the dam. Brief interruptions in data transmissions occurred when the Martek sensor showed a few minor inconsistencies, but the system demonstrated the feasibility of this technique for data acquisition from remote sites. (Adams-ISWS)
W79-01512

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5A.
W79-01517

APPLICATION OF REMOTE SENSING IN ESTIMATING EVAPOTRANSPIRATION IN THE PLATTE RIVER BASIN,
Nebraska Univ., Lincoln.
B. L. Blad, and N. J. Rosenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30634, Price codes: A03 in paper copy, A01 in microfiche. NASA-CR-148775, April 30, 1976. 33 p, 15 fig, 1 tab, 19 ref, 1 append. NASA-NGL28-004-020.

Descriptors: *Evapotranspiration, *Remote sensing, *Model studies, Temperature, Crop production, Hydrology, Irrigation, Mass transfer, Alfalfa, Thermometers, *Nebraska, *Platte River Basin(Neb), *Thermal scanners.

A 'resistance model' and a mass transport model for estimating evapotranspiration were tested on large fields of naturally sub-irrigated alfalfa. Both models make use of crop canopy temperature data, obtained with an IR thermometer and with leaf thermocouples. A Bowen ratio-energy balance model, adjusted to account for underestimation of evapotranspiration during periods of strong sensible heat advection, was used as the standard against which the resistance and mass transport

dels were compared. Daily estimates by the stance model were within 10% of estimates de by the Bowen model. Daily estimates by the ss transport model did not agree quite as well. formance was good on clear and cloudy days also during periods of non-advection and ng advection of sensible heat. The performance he mass transport and resistance models was satisfactory for estimation of fluxes of latent t for short-term (15 min) periods. Both models ded to overestimate at low fluxes. (Roberts-VS)
9-01521

OWPACK GROUND TRUTH: RADAR TEST E, STEAMBOAT SPRINGS, COLORADO, RIL 8-16, 1976,
inger (M. W.) and Associates, Inc., Fort Col-, CO.
primary bibliographic entry see Field 2C.
9-01527

CHNIQUES FOR SAMPLING SALT MARSH NTHOS AND BURROWS,
rgia Univ., Athens. Dept. of Geology.
V. Frey, P. B. Basan, and R. M. Scott.
American Midland Naturalist, Vol. 89, No. 1, 28-234, January, 1973. 2 fig, 9 tab.

criptors: *Sampling, *Salt marshes, *Benthos, rshes, *Burrows, *Georgia.

tain salt marsh benthos are difficult to collect ntitatively, especially the mobile epibenthos endobenthos that dwell within or below dense ss-root masses. Techniques adapted in conjunc- with a study of Georgia marshes helped to lve many of these difficulties. Useful methods uded: (1) High-walled quadrat frames to entrap collect mobile animals. Marsh grass inside the drat is first cropped nearly to root level and oved to secure quantitative grass samples and lear the area of obstructions in collecting the s and other epibenthos. Intrusion causes the eat of crabs to their burrows but this problem is dled by leaving the area at regular intervals, wing the remaining animals to return to the ace, then returning to collect them. (2) Can es were used to obtain volumetric substrate ples, from which endobenthos were rcovered means of a combined sieving-staining-flotation cedure. (3) Polyester plastic casts of burrows burrow networks were used to evaluate depth, sity, volume, and conspecific morphologies of rows. (Maroncelli-Mass)
9-01634

E OF LANDSAT DATA TO RELATE WATER PTH TO OBSERVED AREA OF INUNDA-N IN COASTAL MARSHES,
isiana State Univ., Baton Rouge. School of estry and Wildlife Management.
. Graff.
. Thesis, Louisiana State University and Agri-ural and Mechanical College. December, 1976. , 13 fig, 5 tab, 23 ref.

criptors: *Coastal marshes, *Remote sensing, apping, Wetlands, Census, Aerial photography, veys, Terrain analysis, Marsh management, isiana, Infrared radiation, Distribution patterns, rshes, LANDSAT, Water surface area, *Water th, *Water level fluctuations.

of LANDSAT data to measure changes in er surface areas in a 30.64 sq. kilometer section ouisina's coastal marsh was evaluated. Optical mputer estimates of water surface areas from NDSAT data were compared to optical esti-es derived from low altitude infrared aerial tography. Water depths were taken coincident magery and photography and related to the ace areas obtained by concidendent to imagery photography and relted to the surface areas ined by the three methods. LANSAT data e determined not to be well suited to measure-t of water surfaces areas in this application use of lack of flexibility in scheduling, insuffi-t resolution; need for broader spectral recep-tivity; and too small a scale to properly study such a small area. In coastal marshes numerous small tidal pools and stands are smaller than 100 m; significant hydrologic changes occur in short peri-ods of time; and the surface character is predomi-nantly a heterogeneous mixture of water vegeta-tion, and mud which varies in percent composition from one place to another, and consequently has no distinctive tones, patterns, or textures on the imagery. (Steiner-Mass)
W79-01637

APPLICATION OF LANDSAT IMAGE WET-LAND STUDY AND LAND CLASSIFICATION IN WEST TENNESSEE,
Tennessee University Space Inst. Tullahoma. Remote Sensing Div.
F. Shahrokhi, and N. L. Jones.
1977. 61 p, 17 fig, 6 tab, 18 ref.

Descriptors: *Remote sensing, *Tennessee, *Land use, *Wetlands, Aerial photography, *Classifica-tion, Mapping, Earth-water interfaces, Watershed management, LANDSAT data, West Tennessee.

Information is given on basic equipment and meth-ods for analysis of photographic data obtained from LANDSAT as well as high and low altitude aircraft. In addition, instructions are provided for utilizing such equipment and methods to explore a specific application. This application involves a study to determine land use classifications for a selected watershed in West Tennessee with special emphasis on determining wetland boundaries, and there by provide resource information to appropri-ate agencies for management and preservation pro-grams. (Steiner-Mass)
W79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WET-LANDS IN WEST TENNESSEE,
Tennessee Univ., Knoxville.
J. Rehder, and D. Quattrochi.
National Aeronautics and Space Administration, Contractor Report 3012. June, 1978. 134 p, 9 fig, 8 tab, 31 maps, 27 ref, 2 append.

Descriptors: *Wetlands, *Remote sensing, *Ten-nessee, *Technical feasibility, *Classification, Map-ping, *Land use, Earth-water interfaces, Swamps, Seasonal, *LANDSAT data, West Tennessee.

LANDSAT imagery is a reliable data source for detecting, identifying, measuring, and mapping wetlands in West Tennessee. the degree of carto-graphic and measurement accuracy, however, de-pends upon the interpretative and planimetric qua-lities of the data, such as internal geometric distor-tion, edge sharpness, and scale of the imagery; and the skill of the interpreter. Although the signature exhibited by wetlands is the primary key to their delimitation, the color and tone of swamplands is affected by seasonal dynamics. The ease of difficul-ty of wetlands detection fluctuates temporarily; the amount of water and foliation present are cognitive views for seasonal swampland mapping. 1:25, 000 sale color composite imagery is the most useful type of imagery for accurately mapping and meas-uring wetlands from LANDSAT data. (Steiner-Mass)
W79-01639

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
N. E. G. Roller.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26588, Price codes: A08 in paper copy, A01 in microfiche. Report 193400-14-T to National Aeronautics and Space Administration, Washington, D.C., Office of University Affairs, March, 1977. 155 p, 29 fig, 14 tab, 72 ref.

Descriptors: *Wetlands, *Remote sensing, *Cost comparisons, *Census, Mapping, Aerial photogra-phy, Surveys, Terrain analysis, Marsh manage-ment, Wetland inventories.

Aerial photography is the form of remote sensing from which the greatest amounts of wetlands infor-mation can be derived. For extensive, general-purpose wetland inventories, however, the use of LANDSAT data may be more cost-effective. Air-borne multispectral scanners and radar are, in the main, too expensive to use unless absolutely re-quired. Multistage sampling employing space and high altitude remote sensing data in the initial stages appears to be an efficient survey strategy for gathering non-point specific wetlands inventory data over large areas. The operational mode of remote sensing in supplying inventory data for application to several typical wetland management problems is illustrated by summary descriptions of past ERIM projects. (Steiner-Mass)
W79-01642

IMPROVED TECHNIQUES FOR MARKING AND SAMPLING BAND-APPLIED FERTILIZ-ERS AND PESTICIDES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W79-01709

ASSEMBLY FOR MOUNTING HYDRAULIC SOIL CORE SAMPLER ON TRACTOR FRONT,
Agricultural Research Service, Stoneville, MS.
L. H. Ginn, L. G. Heatherly, and W. J. Russell.
Soil Science Society of America Journal, Vol 42, No 3, p 512-514, May-June, 1978. 4 fig, 6 ref.

Descriptors: Cores, *Sampling, *Soil types, Hy-draulic equipment, *Instrumentation, *Core sam-plers.

A front-mounted tractor assembly for support of a hydraulic soil core sampler was constructed. The design satisfied requirements for rapid soil or root core sampling. An essential part of the assembly is a tool bar which allows lateral movement of the mounted core sampler. The assembly with mount-ed sampler is capable of extracting 1.9 to 10.2-cm diameter cores to depths as great as 125 cm throughout a 102-cm lateral path. (Skogerboe-Colorado State)
W79-01710

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Department of Agriculture, Watkinsville, GA.
A. D. Lovell, J. W. Ellis, R. R. Bruce, and A. W. Thomas.
Agricultural Engineering, Vol. 59, No. 10, p 44-45, October 1978. 4 fig.

Descriptors: *Remote sensing, *Electronic equip-ment, *Water level fluctuations, *Piezometers, Water pressure, Shallow wells, Costs, Instrumenta-tion, Temperature, Humidity, Condensation, *Pressure transducers, Circuitry.

A sensing device has been developed to measure water level changes in small-diameter (1/2 inch) piezometrs at depths between 6 inches and 10 feet. The device consists of a motor, sensor electrodes, and internal electronic circuitry, as well as cables and pulleys. It was designed to resist temperature variations as well as humidity and condensation problems. Materials cost between $39.00 and $75.00, depending on the sensitivity required. (Vi-socky-ISWS)
W79-01924

REMOTE SENSING ASSESSMENT OF DAM FLOODING HAZARDS: METHODOLOGY DE-VELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environ-mental Research.
For primary bibliographic entry see Field 4A.
W79-01980

7C. Evaluation, Processing and Publication

APPLICATION IN THE WATER INDUSTRY OF REGIONAL GEOCHEMICAL MAPS OF ENGLAND AND WALES,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W79-01501

THE 1976 DROUGHT AND NITRATE LEVELS IN THE RIVER EXE BASIN,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W79-01504

VARIATIONS IN THE DURATION OF STABLE SNOW COVER IN THE USSR,
For primary bibliographic entry see Field 2C.
W79-01506

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 4A.
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01531

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD INVESTIGATION OF HIGH WATER DAMAGE IN OSWEGO COUNTY, NEW YORK, APPENDIX IV,
Saint Lawrence-Eastern Ontario Commission, Watertown, NY.
For primary bibliographic entry see Field 4A.
W79-01532

MEASUREMENT OF COASTAL BLUFF RECESSION FROM AERIAL PHOTOGRAPHS, MUSKEGON COUNTY, MICHIGAN, APPENDIX VII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01534

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W79-01557

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 7B
W79-01642

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01714

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
For primary bibliographic entry see Field 5A.
W79-01747

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
For primary bibliographic entry see Field 5C.
W79-01787

AIRBORNE MULTISPECTRAL MAPPING OF THE INTERTIDAL ZONE OF SOUTHERN ALASKA,
Environmental Research Inst of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5C.
W79-01825

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILLWATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W79-01852

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH, JUNIATA RIVER, CLAYSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01853

FLOOD PLAIN INFORMATION: MUDDY BRANCH, MONTGOMERY COUNTY MARYLAND.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK PROVO, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 4A.
W79-01859

FLOOD FREQUENCY DESIGN IN SPARSE DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources
For primary bibliographic entry see Field 4A.
W79-01901

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN TERRY COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 222, September 1978. 68 p, 18 tab, 72 re
24 map.

Descriptors: *Groundwater resources, *Texa
Aquifers, *Data collections, Groundwater, Map
Water resources, Aquifer characteristics, Groun
water availability, Groundwater mining, Ove
draft, Groundwater recharge, Pumping, Proje
tions, Saturated flow, Water wells, *Terr
County(Texas), *Ogallala aquifer(Texas), Pumpag
rates, Pumping lifts, Well yields.

This is one of numerous planned county studi
covering the declining groundwater resource
the Ogallala aquifer in the high Plains of Texa
The report contained maps, charts, and tabulatio
which reflect estimates of the volume of water
storage in the Ogallala aquifer in Terry Coun
and the projected depletion of this water supply b
decade periods through the year 2020. The repo
also contained estimates of pumpage, pumping lift
and other data related to current and future wat
use in the county. However, the report did n
attempt to project that portion of the volume
water in underground storage which may be ult
mateley recoverable. the Ogallala aquifer in Ter
County contained approximately 3.2 million acr
feet ofwater in 1974. Historical pumpage has e
ceeded 130,000 acre-feet annually, which is mo
thatn twuicef the rate of natural recharge to t
aquifer in the county. This overdraft is expected
continue, ultimately resulting in reduced w
yields, reduced acreage irrigated, and reduced a
ricultural production. (Humphreys- ISWS)
W79-01927

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN YOAKUM COUNTY TEXA PROJECTIONS OF SATURATED THICKNES VOLUME OF WATER IN STORAGE, PUM PAGE RATES, PUMPING LIFTS, AND WEL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 221, September 1978. 68 p, 18 tab, 72 r
24 map.

Descriptors: *Groundwater resources, *Texa
*Aquifers, *Data collections, Groundwater, Map
Water resources, Aquifer characteristics, Groun
water recharge, Water supply, Groundwater ava
ability, Groundwater mining, Overdraft, Pumpin

ections, Saturated flow, Water wells, akum County(Texas), *Ogallala fer(Texas), Pumpage rates, Pumping lifts, Well ls.

is one of numerous planned county studies ering the declining groundwater resource of Ogallala aquifer in the High Plains of Texas. report contained maps, charts, and tabulations h reflect estimates of the volume of water in ge in the Ogallala aquifer in Yoakum County of the projected depletion of this water supply decade periods through the year 2020. The rt also contained estimates of pumpage, pump- lifts, and other data related to current and e water use in the county. However, the rt did not attempt to project that portion of olume of water in underground storage which be ultimately recoverable. The Ogallala er in Yoakum County contained approximate- 5 million acre-feet of water in 1974. Historical page has exceeded 130,000 acre-feet annually, h is more than three times the rate of natural arge to the aquifer in the county. This over- is expected to continue, ultimately resulting duced well yields, reduced acreage irrigated, reduced agricultural Production (Humphreys- S)
-01928

URRENCE AND QUALITY OF GROUND ER IN BAYLOR COUNTY, TEXAS,
s Dept. of Water Resources, Austin.
. Preston.
rt 218, July 1978. 123 p, 22 fig, 11 tab, 110 ref.

riptors: *Groundwater, *Texas, *Data collec- *Water quality, *Aquifers, Groundwater ability, Water supply, Aquifer characteristics, r table, Water levels, Well data, Test wells, ers logs, Hydrogeology, Water properties, nical analysis, Dissolved solids, ness(Water), Nitrates, Chlorides, Iron, Boron, disposal, Porosity, Permeability, Transmissi- Aquifer systems, Geology, *Baylor ty(Texas).

or County lies within the drainage basins of razos and Red Rivers in North-central Texas, ring and area of about 857 square miles. ia rocks of the Wichita and Clear Fork ps are found at the surface within the county t where they are overlain by erratic deposits eistocene and Recent alluvium of thee Quater- System. Small to moderate quatities of fresh ghtly saline groundwater are produced from t alluvial deposits. Water quality is generally in this aquifer. However there are some local ems that are probably caused by poor quality flowing in adjacent streams. The Seymor ation of Pleistocene age is the major source oundwater. In parts of a 73 square-mile area ding from the city of Seymour west to the County line and lying between the Brazos Wichita Rivers, wells can sustain yields up to allons per minute. Water quality is generally in the Seymour Formation. More tha 90% og vells sampled produce water with less than milligrams per liter dissolved solids. Chloride nt in the Permian and Quaternary rocks d from 5 to 3,240 milligrams per liter, ad 65 es contained more than the 250 milligrms per (humphreys-ISWS)
01929

LYTICAL STUDY OF THE OGALLALA IFER IN COCHRAN COUNTY, TEXAS, JECTIONS OF SATURATED THICKNESS, UME OF WATER IN STORAGE, PUM- E RATES, PUMPING LIFTS, AND WELL DS,
Dept. of Water Resources, Austin.
Bell, and S. Morrison.
rt 217, July 1978. 68 p, 18 tab, 70 ref, 24 map.

riptors: *Groundwater resources, *Texas, ifers, *Data collections, Groundwater, Maps, resources, Aquifer characteristics, Ground- recharge, Water supply, Groundwater avail- , Groundwater mining, Overdraft, Pumping, Projections, Saturated flow, Water wells, *Coch- ran County(Texas), *Ogallala aquifer(Texas), Pum- page rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining grounddwater resource of the Ogallala aquifer in the High Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Cochran County and of the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion of the volume of water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Cochran County contained approximately 2.9 million acre-feet of water in 1974. Historical pumpage has exceeded 90,000 acre-feet annually, which exceeds considerably the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys-ISWS)
W79-01930

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LUBBOCK COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
A. E. Bell, and S. Morrison.
Report 216, June 1978. 68 p, 18 tab, 70 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, *Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristic, Groundwater recharge, Water supply, Groundwater availability, Groundwater mining, Overdraft, Pumping, Projections, Saturated flow, Water wells, *Lubbock County(Texas), *Ogallala aquifer(Texas), Pumping rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining grounddwater resource of the ogallala aqufer in the High Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Lubbock County and of the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion ofthe volume of water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Lubbock County contained approximately 5.5 million acre-feet of water in 1974. Historical pumpage has exceeded 150,000 acre-feet annually, which is many times the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys-ISWS)
W79-01931

WATER WELL PRODUCTIVITY RELATED TO PHOTO-LINEAMENTS IN CARBONATES OF FREDERICK VALLEY, MARYLAND,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2F.
W79-01954

GROUNDWATER POTENTIAL OF THE KARST REGIONS OF ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W79-01955

CURRENT PROBLEMS IN THE RATIONAL EXPLOITATION OF KARST WATER,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2F.
W79-01958

HYDROLOGICAL PROBLEMS OF JUFRA WELL FIELD, LIBYA,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-01963

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
For primary bibliographic entry see Field 5B.
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5B.
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
For primary bibliographic entry see Field 5B.
W79-01969

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and K. N. Rajo Rao.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 632, Price codes: A08 in paper copy, A01 in microfiche. IIHR Report No 199, June 1977. 151 p, 23 ref, 8 append. OWRT A-054-IA(6). 14-34-0001-6016.

Descriptors: *Stochastic processes, Hydrology, *Computer studies, *Statistical models, *Planning, Operations research, Model studies, *Time series analysis, Statistical methods, Deseasonalization, Data processing, Computers, Statistics, Water resources.

Procedures for analysis of stochastic structure of hydrologic time series were described using an approach which is realistic, practical, and compatible with a subsequent data generation. Essentially, the procedure consists of identifying and estimating annual periodicities in means, standard deviations, and autocorrelation coefficients in the time series. Estimated parameters and computed time dependence structure are removed from the original time series, thereby reducing it to a second order stationary and serially independent process. This aids in constructing a general deterministic-stochastic model representing the relevant time series which can be used for generating synthetic sequences of data that are statistically indistinguishable from the historic data. For demonstration, the approach was applied to real-life problems relating to monthly, weekly, and daily values of hydrologic time series and the results are illustrated. (Majtenyi-IPA)
W79-01989

Group 8A—Structures

8A. Structures

COLLAPSIBLE AND EXPANSIBLE BARRAGE,
Pirelli Furlanis - Applicazioni Idrauliche Agricole Gomma S.p.A., Milan (Italy). (Assignee).
A. Colamussi, and V. Merli.
U.S. Patent No. 4,103,496, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Barriers, *Structures, *Dams, Movable dams, Obstruction to flow, Flow control.

A collapsible and expansible barrage or barrier is described which is composed of a metallic flap and flexible sheet of material, both of which are fixed to a base structure at the bottom of a waterway such as a river, arm of the sea, lagoon or the like, which is to dammed up. The invention provides stability to the barrage in expanded condition when it is enduring stresses such as a flood-wave in a river or the undulating motion in a stretch of sea or lagoon. The base or threshold structure is provided with a hollow recess for housing the barrage in its collapsed state. Means are provided for admitting or extracting water into the closed space defined by the threshold structure, the metallic flap and the flexible sheet. An airtank admits pressurized air into the barrage. (Sinha-OEIS)
W79-01869

AIR-REGULATED SIPHON SPILLWAYS AT SPELGA DAM,
Ferguson and McIlveen, Belfast (Northern Ireland).
For primary bibliographic entry see Field 8B.
W79-01925

WAVE FORCES ON CAUSEWAY-TYPE COASTAL BRIDGES,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01983

8B. Hydraulics

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
J. B. W. Day, K. Rowe, M. Price, and T. K. Tate.
Journal of the Institution of Water Engineers and Scientists, Vol 32, No 4, p 329-340, July 1978. 8 fig, 2 tab, 4 ref.

Descriptors: *Water wells, *Model studies, *Water supply development, *Laboratory tests, *On-site tests, Boreholes, Water yield improvement, Water yield, Groundwater, Aquifers, Well data, Hydraulic models, Water quality, Drawdown, On-site investigations, Foreign countries, Foreign research, *England, Water well development.

The systematic development of a well by intersecting inclined bores ('rakers') drilled from the surface has been attempted. Initial sand tank model studies indicated that, under unconfined conditions with four tubes disposed radially and inclined at 60 deg to the horizontal and under differing levels of the water table, increases in the yield of a central well of about one-third could be obtained for a fixed drawdown. Subsequent field tests on a Chalk well at Lyng, Norfolk, have shown greater increases in yield: three boreholes which were inclined at 45 deg and drilled to intersect a central well about 31 m below the average level of the water table more than doubled its yield. In both cases, results tended to confirm predictions based on theoretical relationships between well diameter and yield for both homogeneous and fissure flow aquifers. (Humphreys-ISWS)
W79-01503

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
R. F. Athow, Jr., and R. A. Boland, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 471, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-18, Sept 1976. 156 p, 88 fig, 39 tab.

Descriptors: *Harbors, *Model studies, *Hydraulic models, *New Jersey, Currents(Water), Velocity, Tides, Tidal waters, Circulation, Parks, Effects, Salinity, Dye releases, Hydraulics, Estuaries, Rivers, *New York Harbor.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire New York Harbor was used to determine the effects of constructing a proposed State park complex on the Jersey City waterfront, just west of Ellis and Liberty Islands. The study included tests in the model of seven different park configurations to define their effects on tidal heights, current velocities, surface current patterns, salinities, and flushing characteristics of a proposed Serpentine (a tidal-influenced canal west of the park area). Based on the results of the model tests, the following conclusions were reached: (1) none of the plans tested would have any significant effects on tidal heights or tidal phasing in the study area; (2) the plans tested would not change the velocity regime of the area, except very locally and with magnitudes not thought to be hazardous to safe navigation or to increase the existing erosion potential of the area; (3) the existing salinity regime of the area would not significantly change as a result of the plans tested; (4) in plans 1, 4, and 7, which include the Serpentine, mass flow will occur through the Serpentine, and a small gyre rotating counterclockwise will develop at the approximate location of salinity and dye sta 2, indicating no through flow at this station, only rotational motion; and (5) dye released at the westernmost end of Morris Canal Basin will move through the Serpentine and be flushed out the south end of the Serpentine, resulting in increased dye concentrations in the wildlife area and a lesser increase at the south entrance to the Serpentine. (Sims-ISWS)
W79-01518

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
F. F. Escoffier.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 523, Price codes: A04 in paper copy, A01 in microfiche. Final Report, GITI-13, August 1977. 75 p, 19 fig, 5 tab, 44 ref, 1 append. DACW 72-74-C-0005.

Descriptors: *Inlets(Waterways), *Tides, *Hydraulics, Coasts, Estuaries, Bays, Beaches, Stability, Flow, Ocean circulation, Tidal effects, Tidal waters, Water circulation, Erosion, Beach erosion, Model studies, Hydraulic models, Reviews, Movable-bed models.

This report presented a summary of several of the important basic developments pertaining to analysis of the hydraulics and related stability of tidal inlets. The original inlet stability concept proposed by Escoffier was extended in light of recent work. The report also contained brief discussions on tidal inlet characteristics and functional design requirements as well as case studies of selected inlets on the U.S. coasts. (Sims-ISWS)
W79-01519

FLOATING BREAKWATERS: AN IDEA WHOSE TIME HAS RETURNED,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 048, Price codes: A02 in paper copy, A01 in microfiche. Report No WSG-TA 75-27, IEEE Ocean, p 707-715, 1975. 20 fig, 6 ref.

Descriptors: *California, *Oregon, *Washington, *Canada, *Breakwaters, *Coastal structures, *Design, *Construction, Waves(Water), Frequency, Comparative costs, Performance, Marinas, Model studies, *Floating breakwaters, *British Columbia(Canada), A-frame breakwaters, Sea grant program.

A review of recent developments in the construction of floating breakwaters was presented. Types of breakwaters considered were the A-frame used at Lund, British Columbia; Alaska modules installed at Tenakee, Sitka, and Whittier, California; those used at Friday Harbor, Holmes Harbor, and Port Orchard, Washington, and Yaquina Bay, Oregon; and many others in the prototype testing stages. Because the performance of floating breakwaters is very sensitive to incident wave frequency, comparisons of performance were made over a range frequencies. Construction techniques and materials were examined, and their field performances were assessed. Some data on the effectiveness of each of the breakwaters and their cost were included for comparison purposes. (See also W76-10460, and W78-00842) (Singh-ISWS)
W79-01525

FLOATING BREAKWATER FIELD ASSESSMENT PROGRAM, FRIDAY HARBOR, WASHINGTON,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee, E. P. Richey, and D. R. Christensen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 183, Price codes: A11 in paper copy, A01 in microfiche. Technical Paper No 76-17, Issued by Army Corps of Engineers, Ft Belvoir, Va., Coastal Eng. Res. Ctr., October 1976. 224 p, 75 fig, 4 tab, 18 ref, 1 append. DACW 72-74-C-0012.

Descriptors: *Washington, *Breakwaters, *Model studies, *On-site tests, *Waves(Water), Performance, Coastal structures, Statistical methods, Boundary processes, Analytical techniques, *Floating breakwaters, *Friday Harbor(Wash).

A theoretical model for predicting the dynamic behavior of a floating breakwater was presented along with a report on a field experiment designed to provide basic data for verifying the model. The dynamic behavior characteristics investigated were total transmitted and reflected waves and their components, wave forces on the breakwater, motions of the breakwater, and forces on the mooring lines. The prediction model was developed from two-dimensional, linearized solutions of the hydrodynamical equations formulated in terms of a boundary value problem for the velocity potential. The floating breakwater at Friday Harbor, Washington, was used as the field experimental platform. Statistical summaries of all data were presented along with analyses of selected transmitted waves, transmission coefficients, and acceleration components. The summaries and analyses constitute a performance report of a particular floating breakwater as well as input to the development of the theoretical model. (Singh-ISWS)
W79-01526

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W79-01655

NUMERICAL SIMULATION OF TIDAL HYDRODYNAMICS, GREAT EGG HARBOR AND CORSON INLETS, NEW JERSEY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.

79-01661

ESIGN WAVE INFORMATION FOR THE REAT LAKES; REPORT 5, LAKE SUPERIOR,
rmy Engineer Waterways Experiment Station, cksburg, MS.
T. Resio, and C. L. Vincent.
vailable from the National Technical Information rvice, Springfield, VA 22161 as ADA-057 127, ice codes: A10 in paper copy, A01 in microfiche. chnical Report H-76-1, June 1978, Report 5 of a ies. 210 p, 6 append, 9 tab, 38 fig, 67 ref.

escriptors: *Great Lakes, *Waves(Water), *Lake perior, *Design wave.

is report contains hindcast wave information it is applicable to many planning and design rposes on Lake Superior. Historical wind data m stations along Lake Superior served as input the numerical hindcast model, and significant ve heights were calculated for 5-, 10-, 20-, 50-, d 100-yr return periods. These results are pro- led in tabular form for 57 points along the Lake perior shoreline. The mean significant period for ch of these wave heights is also given. Informa- n is provided for four seasons of the year (Janu- -March, April-June, July-September, and Octo- -December) and is separated into three ap- oach directions relative to shore. (WES)
79-01662

DIAN CREEK PUMPING STATION, MAN- TO, MINNESOTA; HYDRAULIC MODEL VESTIGATION,
my Engineer Waterways Experiment Station, cksburg, MS.
r primary bibliographic entry see Field 8C.
79-01663

VIGATION CONDITIONS, SUCK BEND ACH, CHATTAHOOCHEE RIVER, ALA- MA AND GEORGIA; HYDRAULIC MODEL VESTIGATION,
ny Engineer Waterways Experiment Station, cksburg, MS.
K. Melton, and J. J. Franco.
ailable from the National Technical Information vice, Springfield, VA 22161 as AD-A056 704, ce codes: A03 in paper copy, A01 in microfiche. chnical Report H-78-10, June 1978. 30 p, 10 fig.

scriptors: *Hydraulic models, *Chattahoochee er(Ala-Geo), *Navigation conditions, *Naviga- channels, *Suck Bend(Chattahoochee River), ovable-bed models, Shoaling, Alabama, Geor-

novable-bed model reproducing about 1.5 miles he Chattahoochee River to an undistorted scale :72, model-to-prototype, was used to develop ns that would eliminate or reduce shoaling to mit uninterrupted navigation and to improve igation for larger tows through Suck Bend ch and in the approach to proposed State hway 10 bridge. Results indicate: (1) Naviga- conditions in Suck Bend are affected by shoal- of the bend's channel, elevation of bedrock, adverse currents. (2) Shoaling in the bend can eliminated with training structures but they uld not provide satisfactory navigation condi- s through the bend and in the approach to posed bridge for larger tows. (3) Training ctures and excavation and filling along the t bank in the bend to eliminate irregularities in bank line and increase radius of curvature of lower bend channel could provide satisfactory igation conditions. (4) Larger down-bound s would have to flank for passage through ge span even with the realigned right bank use of the short approach to bridge. (5) Align- t of currents through proposed bridge could be roved with vane dikes along left side of chan- upstream of bridge but dikes would reduce the euver area and could be navigation hazard. ES)
9-01664

AN INTRODUCTION TO EMISSION UNI- FORMITY,
Rain Bird Sprinkler Mfg. Corp., Glenora, CA.
K. Solomon.
Drip/Trickle Irrigation, Vol 2, No 2, p 6-10, January/February 1977. 3 fig.

Descriptors: *Irrigation systems, *Irrigation engineering, *Irrigation design, Hydraulics, Hydraulic design, Irrigation efficiency, Flow rates, Uniform flow, Uniformity coefficient.

The more nearly perfect a system is in terms of emission uniformity, the more it is likely to cost. Various devices, material substitutions and design techniques are available to minimize the problems leading to nonuniformity of emission, but they all cost money and/or time. So the costs of approaching perfection must be weighed carefully against the costs of not achieving it. (Skogerboe-Colorado State)
W79-01686

PREDICTION OF FLOW HYDRAULICS FOR VEGETATED CHANNELS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
D. T. Y. Kao, and B. J. Barfield.
Transactions of the American Society of Agricultural Engineering, Vol. 21, No. 3 p 489-494, May-June 1978. 8 fig, 1 tab, 15 ref.

Descriptors: *Channel flow, *Grassed waterways, *Vegetation effects, *Roughness(Hydraulic), Model study, Mathematical models, Laboratory tests, Flumes, Grasses, Shallow water, Hydraulic properties, Hydraulic similitude, Flow, Graphical analysis, Vegetation, Hydraulics.

Simulated dense vegetation with random blade arrangements and different blade flexibilities were used to determine the hydraulic properties of flow of small, non-submerging depths. With the water flowing among the randomly patterned vegetation blades, drag resistance becomes the dominant force that retards the flow was established based on the momentum balance in the system. Experimental results were used to determine the coefficient of blade resistance and were plotted in terms of blade width and flow depth reynolds number respectively. Based on these plots and on successful introduction of the three different sets of parameteric curves, a graphical method was developed to permit the determination of flow depth in the vegetated channel. (Sims-ISWS)
W79-01726

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01829

FLOOD FREQUENCY DESIGN IN SPARSE-DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W79-01901

HYDRAULIC FRICTION LOSS IN SMALL DIAMETER PLASTIC PIPELINES,
Utah Univ., Logan. Dept. of Civil and Environmental Engineering.
T. C. Hughes, and R. W. Jeppson.
Water Resources Bulletin, Vol. 14, No 5, p 1159-1166, October 1978. 1 fig, 1 tab, 2 ref.

Descriptors: *Friction, *Plastic pipes, *Mathematical studies, Design, Design criteria, Hazen-Williams equation, Darcy-Weisbach equation, Reynolds number, Water supply, Hydraulics, Pipes, Equations, *Hydraulic friction, Friction loss, Smal plastic pipe.

Although estimation of hydraulic friction loss in pipelines is one of the most frequent routine computations made by water supply engineers, almost no post-construction analysis of the accuracy of these calculations exists in the literature. This paper reported the field measured friction losses in 3 one-mile sections of small diameter pvc pipe which had been in service for 10 years. Hazen-Williams and Darcy-Weisbach equations were examined to provide a framework for comparing Hazen-Williams coefficients recommended by pipe manufacturers to those obtained by the field measurements. The conclusion was that the C sub HW of 150 recommended by most pvc pipe manufacturers is too high for the diameter-velocity combinations encountered in rural dead-end small diameter lines. The measured coefficients averaged 133, which is close to that predicted by superimposing Hazen-Williams coefficients on the Moody diagram from which the fricton factor for the Darcy-Weisbach equation is obtained. (Lee-ISWS)
W79-01915

AIR-REGULATED SIPHON SPILLWAYS AT SPELGA DAM,
Ferguson and McIlveen, Belfast (Northern Ireland).
F. F. Poskitt, and E. M. Elsaway.
Journal of the Institution of Water Engineers and Scientists, Vol. 30, No. 4, p 177-190, June 1976. 9 fig, 13 ref.

Descriptors: *Siphons, *Spillways, *Hydraulic structures, *Model studies, Hydraulic models, Flow control, Flow characteristics, Pressure, Water pressure, Negative pressure, Hydraulic similitude, Laboratory tests, Foreign research, *Ireland, *Spelga Dam(Ireland), Air-regulated siphon.

The Spelga Dam is a 30 m high, concrete, gravity dam constructed for water supply purposes in 1957 in the Mourne Mountains in Northern Ireland. Increasing water demand required raising the impoundment level without increasing dam height. Investigations resuled in a decision to replace the 2 existing profiled surface spillweirs with automatically priming and de-priming air-regulated saddle siphons. Hydraulic modes obtained on water discharge, air flow, and pressure distribution for various lip-lengths and lip-levels and different types of ski-jumps. Using these data, an optimum design was reached, and the influence of each parameter on siphon performance was gauged. When priming, models exhibit 4 phases of flow similar to those observed in other air-regulated siphons which can be summarized as: (1) Weir flow - When the reservoir water level reaches the siphon crest, water flows over the crest; and the nappe forms 4 airpockets within the siphon barrel and provides an air seal at its exit. (2) Subatomspheric weir flow - As the reservoir level continues to rise, air is prevented from gaining direct access to the siphon entrance as well as to its exit. (3) Partialized flow - In this phase, the siphon is partially primed, and draws in and becomes filled with an air/water mixture. Any small increases in level are followed by relatively large increases in water discharge. (4) Black-water flow - A continuing rise in level exhausts the remaining air from the siphon and prevents any further air being drawn in under its hood, and the siphon becomes fully primed and reaches black-water flow. On de-priming the cycle is revesed, and the model exhibited good air regulation and minimal loss of impounding level. The Spelga siphons enabled an increase of 600 Ml or 22% in storage capacity to be secured. (Humphreys-ISWS)
W79-01925

WAVE FORCES ON CAUSEWAY-TYPE COASTAL BRIDGES,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
K. H. Denson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 367, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University Report, October, 1978. 42 p, 32 fig, 1 tab, 2 ref. OWRT A-118-MISS(1). 14-34-

0001-8026.

Descriptors: *Water waves, *Structures, *Hydraulic models, Ocean waves, Wave action, Concrete structures, Failures, Hydraulic similitude, Physical models, Mississippi, Model studies, Bridges, *Wave forces, *Causeways, Bay St Louis(Miss), Hurricane Camille.

A 1:24 scale model of the Bay St. Louis, Mississippi bridge was used for the determination of lift and drag forces and rolling moment caused by normal incidence waves. The bridge was damaged by Hurricane Camille in 1969. The Bay St. Louis Bridge is a causeway-type, four-lane bridge of beam and slab construction. Pairs of lanes are structurally separated. Wave forces and moment were determined separately for the seaward and landward pairs of lanes. Thirty pages of design curves are presented in dimensionless form for scaling to prototype dimensions. The study was made more applicable to other bridges of similar geometry by varying the height of the bridge deck above the bay bottom. Results predict observed anchorage failure in the Bay St. Louis bridge.
W79-01983

8C. Hydraulic Machinery

GEOTHERMAL POWER AND WATER PRODUCTION STUDIES AT THE UNIVERSITY OF CALIFORNIA,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 3E.
W79-01546

INDIAN CREEK PUMPING STATION, MANKATO, MINNESOTA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
B. P. Fletcher.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 687 Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-78-8, June 1978. 91 p, 3 tab, 22 photos, 48 fig.

Descriptors: *Pumping plants, *Flow characteristics, *Minnesota, Hydraulic models, *Indian Creek pumping station(Minn).

Model study conducted to evaluate characteristics of inflow to the original design gravity-flow section and pump sump and to develop modification for improving the distribution of flow to the gravity-flow section and pump intakes. The 1:10-scale model indicated need for minor modification to improve flow characteristics in the forebay and ensure satisfactory flow characteristics and pressures near the pump intakes. Major problems at pump intakes were generated by the concentrated jet produced adverse currents and turbulence near pump intakes. Satisfactory approach flows were obtained by installing divider walls to isolate each pump. Major problems at entrance to the gravity-flow section were generated by abrupt transition from the forebay to the gravity-flow section. These were Alleviated by streamlining entrance to the gravity-flow section. Improved flow conditions at entrance to the gravity-flow section. Improved flow conditions at entrance to the gravity-flow section reduced severe drawdown at the right abutment and provided a more direct route for flow to enter the gravity-flow section. Improved flow conditions to pump intakes eliminated surface vortexes and reduced pressure fluctuations from about 3.6 ft of water with the original design to 1.0 ft of water with recommended design. (WES)
W79-01663

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
1977. 83 p, 22 tab, 25 fig.

Descriptors: *Recreation facilities, *Hydroelectric power, *Multiple-purpose projects, *Cost-benefit analysis, *Economics, Hydroelectric project licensing, Reservoirs, Streamflow, Hydrology, Flood control, Irrigation, Amortization, Geology, Climate, Reservoir sites, Drainage, California, *Kern River Basin(CA), *Water service organizations, Water availability, Electric utility systems.

This report offers an extensive investigation of the Kern River Basin, its economy, its existing water and related land developments, its future economic and human needs, and possible future development and utilization of water resources. The Kern River Basin is located within Kern and Tulare Counties, CA. The water and related land resources of the Basin have been developed to a substantial degree for hydroelectric power, irrigation, flood control and recreational purposes. There are four hydroelectric power developments in the Basin located on the Kern River, one just above Isabella Lake and the other three in the canyon below the lake. The underdeveloped portions of the Basin include reservoir sites, opportunities for hydroelectric power development, and lands for future recreational expansion. In evaluating the potential multiple-purpose projects, the staff derived investment costs based on estimates contained in the Corps of Engineers' Draft Review Report on the Kern River Basin, July 20, 1966. These cost estimates were reviewed, modified, and updated as necessary. The annual costs used in the benefit-cost analyses include fixed charges, operation and maintenance expenses, and administration and general expenses. Project benefits considered included flood control, recreation, fish and wildlife enhancement, irrigation and hydroelectric power production. (Coan-NC)
W79-01835

HOT WATER RESERVOIR,
Aktiebolaget Atomenergi, Stockholm (Sweden). (Assignee).
P. H. E. Margen.
U.S. Patent No. 4,102,134, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1403, July 25, 1978.

Descriptors: *Patents, *Reservoir construction, Impoundments, Surface waters, Heated water, Thermal insulation, Engineering structures, Barriers.

A hot water reservoir for a district heating plant may be a comparatively small one, for absorbing the variations in heat consumption between night and day, or it may be an extremely large one, for absoring the variations in heat consumption between summer and winter. The invention provides a simple and inexpensive hot water reservoir by using a flexible wall for enclosing a limited portion of a natural or artificial lake, sea bay or other body of water. The hot water reservoir comprises buoys floating on the surface of a lake and enclosing a limited area of the lake, a substantially vertical wal of a flexible material having its upper edge fastened to the buoys, weights fastened to the lower edge of the wal to maintain it in a vertical position, cables extending between the buoys and weights to reinforce the wall, and anchoring wires extending from the buoys toward the interior of the reservoir. The wall of the reservoir consists of two or more sheets substantially impervious to water and having stagnant water between them. They consist preferably of a fabric coated with plastic which can resist the temperature of the hot water. The loss of heat to the atmosphere is reduced by placing a heat insulating sheet to float on the hot water surface. (Sinha-OEIS)
W79-01862

8D. Soil Mechanics

STATE-OF-THE-ART APPLICABILITY OF CONVENTIONAL DENSIFICATION TECHNIQUES TO INCREASE DISPOSAL AREA STORAGE CAPACITY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
S. J. Johnson, R. W. Cunny, E. B. Perry, and L. Devay.
Available from the National Technical Informat Service, Springfield, VA 22161 as ADA-041 Price codes: A10 in paper copy, A01 in microfic Technical Report D-77-4, April 1977. 122 p, 59 34 tab, 75 ref, 4 append.

Descriptors: *Dredging, *Density stratificat *Storage, Disposal, Dikes, Seepage, Dewater Soil stabilization, Waste disposal, Rivers, S ments, *Densification techniques, Storage ca ity.

Dredging to maintain or increase project depth navigable channels and harbors often requires fined dredged material disposal areas. In m locations it is difficult to find suitable conf disposal areas, and even where available, envi mental constraints prevent or restrict their This study determined whether conventional s lization techniques can be used to densify dewater material as a means for increasing storage capacity of disposal areas. This was on a judgement basis and without laboratory field research. Coarse-grained material was included, thus restricting the study to clays silty clays which have high water contents placement in disposal areas. It was concluded conventional stabilization techniques can be to increase disposal area capacity but that eco ic constraints restrict their use in some areas. pendixes included a description of river sedim a general description of conventional densifica techniques, and calculations for the economic uation of densification techniques. (Roberts-IS
W79-01520

SUMMARY REPORT OF THE PILOT ST PROGRAM, GREAT LAKES SHOREL DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Ce Div.
For primary bibliographic entry see Field 4A.
W79-01528

8E. Rock Mechanics and Geology

RESULTS OF TRACING EXPERIMENTS CONSTRUCTION OF RESERVOIRS IN STIC REGIONS,
Technische Hochschule, Graz(Austria). Dep Hydrogeology.
J. G. Zotl.
In: Hydrologic Problems in Karst Regions; ceedings of Symposium held at Western Kent University, Bowling Green, Kentucky, Apr 29, 1976. Department of Geography and Geo Western Kentucky University, Bowling G Kentucky, p 450-458, 1977. 4 fig, 8 ref.

Descriptors: *Karst, *Tracers, *Hydroged *On-site tests, On-site investigation, Explor Seepage control, Reservoirs, Foreign cou Foreign research, Sinks, Carbonate rocks, age, Karst hydrology, Groundwater move *Austria, *Greece.

Tracing experiments constitute one tool a several means of investigating karst terrains regard to construction of reservoirs. Two exa of field experiments were described. In the massif of the 'Steinernes Meer,' a combined tion of fluorescein dye And dyed lycop spores into various sinkholes was carried check the possibility of constructing a reserv an altitude of 1,400 m a.s.l. or 700 m abo Saalach valley, where a powerplant was situated. The result of the experiment showe the main karstwater body in the area has discharge still at the local base level of 1,4 except for some single karst tubes to the S valley. By concrete injections the basin b fully impermeable, and the powerplant is wo By a tracing experiment carries out in the reg the Evinos River (Western Greece), it wa firmed that the base level of erosion influenc possibility of using a river basin for the co

n of a reservoir. The injection of fluorescein dye
l potassium chloride showed a connection be-
een a katavothre in the Evinos basin and the
ings of Nafpaktos in the Gulf of Korinth, the
sent base level of erosion. (See also W79-01932)
9-01976

E OF THERMONICS IN FOUNDATION
UDIES IN KARSTIC TERRANE,
drotechnics, Albuquerque, NM.
M. Turner.
Hydrologic Problems in Karst Regions; Pro-
dings of Symposium held at Western Kentucky
versity, Bowling Green, Kentucky, April 26-
1976. Department of Geography, Geology,
stern Kentucky University, Bowling Green,
tucky, p 459-462, 1977. 1 fig, 1 ref.

criptors: *Water temperature, *Karst,
oundwater movement, *Kentucky, Dam foun-
ons, Leakage, Exploration, Surveys, Aquifers,
ntiometric level, Water table, Groundwater,
age.

rmonics is the analysis of groundwater flow
ms based upon the redistribution of rising
hermal heat and/or shallow soil heat by
ing groundwater. Because grounddwater is
lly in motion, it may act as moving heat sink
eat source, the strength of which is related to
mass-rate of groundwater movement. Tem-
ure measurements at shallow depths in small
eter holes are usually sufficient to pin-point
ocations of wide zones or narrow fractures
ining groundwater moving at relatively high
Thermonics used in conjunction with frac-
trace analysis is probably the most powerful
od of locating fractures and solution features
rstic terrane which contains moving ground-
and which may pose problems in earthen
embankment stability. In 1971, a Thermonic
y of Wolf Creek Dam in Kentucky was made
e purpose of Determinig whether there were
ct zones of subflow in the dam foundation.
ination of both piezometric and Thermonic
nation indicated that piezometric information
is not sufficient to define the path of high
dwater flow. The most significant conclusion
ed was that the entire foundtion flow pattern
am foundation can be defined by Thermonics
to construction, provided the foundation is
ted. (See also W79-01932) (Humphreys-
)
01977

Concrete

JDY OF ARTICULATED CONCRETE RE-
IENT MATTRESS: TEST AND ANALY-
ESULTS OF FY 1975 PROGRAM,
ruction Engineering Research Lab. (Army),
paign, IL.
rney, and J. Prendergast.
ble from the National Technical Information
e, Springfield VA 22161 as AD-A033 440.
CERL-TR-M-194, November 1976. 65 p,
5 append. IAO LMMDC-FA-75-2.

ptors: *Erosion control, *Bank protection,
ning walls, *Mississippi River, On-site tests,
te structures, Shore protection,
Forces), Load distribution, Rivers, Monitor-
ructural analysis, Measurement, Instrumen-
Testing, Testing procedures, Prototype
train gages, Articulated concrete mattresses.

port presented results of the fiscal year 1975
) portion of a program to determine the
rde and distribution of forces developed
launching of articulated concrete mattresses
banks of the lower Mississippi River and to
guidance for design changes in the mat
re. The FY 75 work involved monitoring
ching of some of the approximately 10,000
ental squares cast with two 4,000-lbf (17.8
aking strength longitudinal wires instead of
Results indicated that the two-longitudinal-
t will have adequate strength. Results also
ed conclusions drawn from earlier work in the program (F. Kearney and J. Prendergast, Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1974 Program, U.S. Army construction Engineering Research Laboratory Technical Report M-94/ ADA021774, 1976). (Humphreys-ISWS)
W79-01513

HOW TO INSURE A GOOD BRIDGE PLUG JOB,
Welex, Venice, LA.
D. Prince.
Special Report, June, 1973, 1 p.

Descriptors: *Wells, *Cement plug, Oil spills, Well casings, Well permits, *Well plugs, *Bridge plug, Well cap, Dead well.

A widely used bridge plug employs delayed-time valve closing to allow gas agitation or fluid flow to continue while an initial cement dump sets. After solid set, the bleed-off valve is automatically closed by dual timers preset on the surface before running the plug. Additional cement can then be dumped if well conditions and plug requirements so indicate. The plug can set in operating wells under pressure or in dead wells. The former costs slightly more because of the complexities of working under pressure and the special material and equipment required. A plug job is not recommended immediately after (3 to 4 hours) a well has been killed; best results are usually obtained when the well has had a chance to stabilize for at least a day, preferable two or three. (Bradbeer-NWWA)
W79-01549

8G. Materials

A STUDY OF ARTICULATED CONCRETE REVETMENT MATTRESS: TEST AND ANALYSIS--RESULTS OF FY 1975 PROGRAM,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 8F.
W79-01513

HOW TO INSURE A GOOD BRIDGE PLUG JOB,
Welex, Venice, LA.
For primary bibliographic entry see Field 8F.
W79-01549

MANOEUVERABLE WEIR,
Pirelli Furlanis - Applicazioni Idrauliche Agricole Gomma S.p.A., Milan (Italy). (Assignee).
A. Colamussi, and V. Merli.
U.S. Patent No. 4,103,497, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Structures, *Weirs, Overflow, Streamflow, Water levels, Channels, Flow control.

A weir for damming water in a waterway comprises a base member placed on the bottom of the waterway and a pivotable flap member having a wall enclosing an elongated space adapted to contan air under pressure. The flap member has one end wal hinged to the base member and is inclined upward from its hinged end above the base member. The manoeuverable weir is characterized by the fact that it contains openings in the metallic flap from which conduits depart creating a water current. (Sinha-OEIS)
W79-01870

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
M. J. Smith, P. Miles, N. Richardson, and M. A. Finan.
U.S. Patent No. 4,105,551, 7 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 973, NO 2, p 737, August 8, 1978.

Descriptors: *Patents, *Water treatment, *Water softening, Scaling, hardness(Water), Chemical reactions, Inhibitors, Corrosion, Water quality control.

A method of inhibiting the precipitation of the scale forming salts of calcium, magnesium, barium and strontium from aqueous systems comprises adding to the system a scale inhibiting amount in the range of 1-200 ppm of a product such as a telomeric compound. The inhibitor product is used in conjunction with an effective amount of a dispersing or threshold agent. (Sinha-OEIS)
W79-01887

INFLUENCE OF KARST ON ENGINEERING IN IRELAND,
Geological Survey of Ireland and Minerex, Ltd., Dublin.
D. J. Burdon.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 419-431, 1977. 1 fig, 30 ref.

Descriptors: *Karst, *Engineering, *Geomorphology, *Natural resources, Reviews, Geology, Carbonate rocks, Limestones, Lime, Gypsum, Sands, Gravels, Agriculture, Coasts, Lakes, Rivers, Groundwater, Foreign countries, *Ireland.

This report aimed at bringing together published information on the karst of Ireland as karst affects engineering works. The paper emphasized the mainly indirect effects of karst and karstification processes on engineering activities, rather than hydrology, hydrogeology, or groundwater development. The geology and geomorphological conditions of the affected area were introduced first--an area of carbonate rocks that extends over about half the land surface. Karstic influences on engineering works then were described under 3 major categories: water-soluble raw materials in quarrying and mining; non-water engineering works; and water-related engineering works. The paper concluded with 30 Irish references, all of which have been quoted or referred to in the text. This may be considered as a first attempt to bring together the scattered literature dealing with the geological problems encountered by the engineer working in those areas of Ireland which are unerlain by carbonate rocks. (See also W79-01932) (Humphreys-ISWS)
W79-01973

CONSTRUCTION METHODS WHICH RECOGNIZE THE MECHANICS OF SINKHOLE DEVELOPMENT,
Reitz and Jens, Inc., St. Louis, MD.
H. M. Reitz, and D. S. Eskridge.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 432-438, 1977. 3 fig, 2 ref.

Descriptors: *Karst, *Sinks, *Rock properties, *Missouri, Soil mechanics, Construction, Foundation rocks, Carbonate rocks, Filters, Geomorphology, Fractures(Geologic), Land subsidence, Limestones, Methodology, Graded filters, Soil arching.

Sinkhole formation starts by loss of soil downward into fissures in the surface of bedrock from hydraulic pressure surges at times when the system of joint and bedding plane fissures is filled with groundwater. Tracts of karst topography can be developed best by preventing anything but infiltrating water from going beneath the ground and by building inverted graded filters, topped out with controlled fills over historic sinkhole locations. For rigid support of heavy column loads, horizontally stratified bedrock can be turned into an elastic continuum with selective investigations, and grouting for strength, not for watertightness, with the depth and nature of the investigation and

construction varying with the characteristics of the heavy structure to be supported. In summary, the dynamic character of sinkholes must be recognized. The fact that a filled sink can return to life from above as well as below was recognized in the treatment methods outlined. (See also W79-01932) (Humphreys-ISWS)
W79-01974

8I. Fisheries Engineering

EVALUATION OF STREAM IMPROVEMENT PRACTICES IN SOUTHEASTERN TROUT STREAMS,
Oklahoma Cooperative Fisheries Research Unit, Stillwater.
O. E. Maughan, K. L. Nelson, and J. J. Ney.
Available from the National Technical Information Service, Springfield VA 22161 as PB-289 263, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, Bulletin 115, September 1978. 67 p, 10 fig, 14 tab, 37 ref. OWRT A-067-VA(1).

Descriptors: *Stream habitat improvement, Virginia, *Stream improvement structures, Gabions, Southeast(US), Mountain Trout streams, Boulder emplacement, Log dams, Instream cover.

Most stream improvement techniques were designed and tested in the northern and western areas of the U.S., but little research has been done to evaluate the impact of these practices as they are used in the Southeast. This research evaluated the effects of stream rehabilitation devices on four southeastern Virginia trout streams. In both improved and reference sections of the streams, the study measured various physical parameters, and fish and benthic macroinvertebrate populations. Specifically, the streams were investigated to determine the effectiveness of stream improvement structures in providing increased habitat for trout and nongame species, and to determine the possible influences of the devices on aquatic invertebrates. The structure examined included log dams, gabion deflectors, and random boulder emplacements. In some cases, large pools were impounded above the dams; noticeable pool formation occurred below all dams. Runs and pools were associated with 11 of 18 gabions; the use of boulders to increase cover met with variable success. Fish biomass, trout biomass, and invertebrate numbers generally did not differ significantly between improved and reference sections. The utility of various stream improvement devices is dependent on their proper placement and on a correct assessment of their various limiting factors. Since each stream has a unique combination of biological, physical, and chemical parameters, stream improvement should be performed on a site-specific basis. This study should provide needed data for proper selection, design and installation of stream improvement structures.
W79-01590

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS, VOL. I. WORKING GROUP RESULTS,
Sigma Research, Inc., Richland, WA.
For primary bibliographic entry see Field 5C.
W79-01755

THE EFFECTS OF HIGHWAY CONSTRUCTION ON THE HYDROGEOLOGIC ENVIRONMENT AT BOWDEN, WEST VIRGINIA,
Bowden National Fish Hatchery, WV.
For primary bibliographic entry see Field 5B.
W79-01975

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W79-01656

A REVIEW OF THE LITERATURE AND A SELECTED BIBLIOGRAPHY OF PUBLISHED AND UNPUBLISHED LITERATURE ON MARINE BIRDS OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5C.
W79-01814

10D. Specialized Information Center Services

HYDROLOGIC PROBLEMS IN KARST R GIONS.
For primary bibliographic entry see Field 2F.
W79-01932

PROGRESS OF KNOWLEDGE OF HYDRO OGY OF CARBONATE ROCK TERRANES - REVIEW,
Geological Survey, Reston, VA. Office of Chief Hydrologist.
For primary bibliographic entry see Field 2F.
W79-01933

REVIEW OF THE PHYSICAL HYDROLO OF THE CENTRAL KENTUCKY KARST,
National Park Service, Mammoth Cave, KY. lands Research Lab.
For primary bibliographic entry see Field 2F.
W79-01938

SUMMARY OF GEOHYDROLOGIC RE TIONSHIPS IN THE LOST RIVER WAT SHED, INDIANA, APPLIED TO WATER U AND ENVIRONMENT,
Indiana Univ. at Bloomington. Dept. of Geolo
For primary bibliographic entry see Field 2F.
W79-01939

INFLUENCE OF KARST ON ENGINEERI IN IRELAND,
Geological Survey of Ireland and Minerex, Dublin.
For primary bibliographic entry see Field
W79-01973

10F. Preparation Of Reviews

WATER REUSE HIGHLIGHTS, A SUMMA VOLUME OF WASTEWATER RECLAMAT AND REUSE INFORMATION,
American Water Works Association Rese Foundation, Denver, CO.
For primary bibliographic entry see Field
W79-01978

SUBJECT INDEX

08 PLANNING
Innovative Management Concept for 208 Planning,
W79-01848 5G

BSORPTION
Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

CID MINE WATER
Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

CTIVATED CARBON
Organic Impurities from Industrial Waste Water Removal - By Treatment with Activated Carbon Containing Manganese Oxide(s) Useful in Chemical Industry.
W79-01703 5D

Method and Apparatus for Purification of Water,
W79-01886 5D

CTIVATED SLUDGE
Mycoflora of Activated Sewage Sludge,
W79-01548 5E

Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

The Relationship of Biological Population to Activated Sludge Plant Performance,
W79-01619 5D

Method for Adenosine 5'-Triphosphate Measurement on Coke Waste Activated Sludge,
W79-01723 5D

Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

The Evolution of Tannery Effluent Treatment--Guidelines for Further Investigations,
W79-01780 5D

DENOSINE 5'-TRIPHOSPHATE
Method for Adenosine 5'-Triphosphate Measurement on Coke Waste Activated Sludge,
W79-01723 5D

SORPTION
Organic Impurities from Industrial Waste Water Removal - By Treatment with Activated Carbon Containing Manganese Oxide(s) Useful in Chemical Industry.
W79-01703 5D

ADVECTION
The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

AERATION
Toxicity Removed by Foam Separation,
W79-01770 5D

Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

AERIAL PHOTOGRAPHY
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

AEROSOLS
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

Bacterial Aerosols from Cooling Towers,
W79-01694 5C

AFRICA
Analysis of Fallow-Farming Systems in Semi-Arid Africa Using a Model to Simulate the Hydrologic Budget,
W79-01785 2D

AGRICULTURAL RUNOFF
Feedlot Pollution: A Solvable Problem.
W79-01671 5B

AGRICULTURE
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

AIR POLLUTION
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

AIR POLLUTION EFFECTS
Bacterial Aerosols from Cooling Towers,
W79-01694 5C

AIRBORNE SURVEYS
Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

ALABAMA
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Management of Local Water Systems in Alabama,
W79-01536 6E

Mycoflora of Activated Sewage Sludge,
W79-01548 5E

Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5G

Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956 2F

An Unobtrusive Measure of the Recreational Value of a Lake,
W79-01986 6B

ALAMITOS BAY (CALIF)
Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

ALASKA
Marine Biological Effects of OCS Petroleum Development,
W79-01788 5C

Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

ALBEDO
Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

ALBERTA (CANADA)
Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

ALCONA COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

ALEWIFE
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

ALFALFA
Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

ALGAE
Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

ALGORITHMS
Transient Two-Dimensional Problems Utilizing the Least Squares Algorithm,
W79-01557 2G

ALLUVIAL CHANNELS
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

ALTERNATIVE COSTS
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

AMMONIA FERTILIZERS
Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

AMMONIUM COMPOUNDS
Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

ANAEROBIC CONDITIONS
Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

ANAEROBIC DIGESTION
Predicting the Anaerobic Degradation of Organic Chemical Pollutants in Waste Water Treatment Plants from Their ELectrochemical Reduction Behavior,
W79-01539 5B

Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547 5E

ANAEROBICALLY DIGESTED SLUDGE
Mycoflora of Activated Sewage Sludge,
W79-01548 5E

ANALYTICAL TECHNIQUES
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

ANIMAL BEHAVIOR
The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5C

ANIMAL PARASITES
The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

ANIMAL POPULATIONS
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

ANTITRANSPIRANTS
Reducing Phreatophyte Transpiration,
W79-01562 3B

A Nondestructive Approach to Reducing Riparian Transpiration,
W79-01586 3B

APPLICATION EQUIPMENT
Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

AQUATIC ALGAE
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

AQUATIC ENVIRONMENT
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

AQUATIC LIFE
Impact of Residual Biosolids on Receiving Water Quality,
W79-01609 5C

Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01774 5C

AQUATIC PLANTS
The Salt Marsh Flora of Mississippi,
W79-01632 2I

The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

AQUATIC VEGETATION
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

AQUATIC WEEDS
Morphological Variation of Elodea in Western Massachusetts: Field and Laboratory Studies,
W79-01743 5C

The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

AQUIFER MANAGEMENT
Dolomitization in the Floridan Aquifer,
W79-01749 2F

AQUIFER TESTING
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

AQUIFERS
Experience in Artificial Ground-Water Recharge for Water Supply in Lithuania,
W79-01508 4B

Dolomitization in the Floridan Aquifer,
W79-01749 2F

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields
W79-01928 7C

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yield
W79-01931 7C

Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2

Storage Properties of Fractured Formations,
W79-01950 2

Model Analysis of Closed Systems in Karst Aquifers,
W79-01952 2

Flow to a Well in an Unconfined Fractured Aquifer,
W79-01953 2

Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley Maryland,
W79-01954

Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956

On the Management of Karst Aquifers in Saudi Arabia,
W79-01962

Hydrological Problems of Jufra Well Field Libya,
W79-01963

Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969

Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970

Artificial Ground-Water Recharge as a Water Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992

ARCHITECTURE
A Land Study for Downtown Lake Charles,
W79-01838

ARCTIC
Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784

Biological Fate of Metals in Fish,
W79-01792

Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

ARCTIC CHAR
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

ARGENTINA
Technical-Economical Solution to the Problem of Effluents in an Integrated Paper Mill (Solucion tecnico-economica del problema del efluente en una plant papelera integrada en operacion),
W79-01593 5D

ARIZONA
World's Largest Solar-Powered Irrigation System Operating in Arizona: Rising Energy Costs Cause Exploratory Venture.
W79-01692 3F

ARKANSAS
A Preliminary Ecological Survey of Dardanelle Reservoir Prior to Nuclear Facility Effluent Discharge,
W79-01591 6G

AROCLORS
Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

ARSENIC
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

ARSENICALS (PESTICIDES)
Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

ARTHROPODS
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

ARTIFICIAL BEACHES
Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

ARTIFICIAL RECHARGE
Experience in Artificial Ground-Water Recharge for Water Supply in Lithuania,
W79-01508 4B

Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

ASCIDIANS
Filter-Feeding Ethology of Benthic Invertebrates (Ascidians). V. Influence of Temperature on Pumping, Filtration, and Digestion Rates and Rhythms in Phallusia Mamillata,
W79-01653 5C

ASHTABULA RIVER
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

ASSAY
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

ATLANTIC OCEAN
Report of Waste Source Inventory and Evaluation, Dade County, Florida.
W79-01834 5G

ATMOSPHERE
Exchange of Carbon Dioxide Between the Atmosphere and Lake Ontario,
W79-01550 2K

ATMOSPHERIC STABILITY
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

ATTITUDES
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

Consumer Attitudes Toward Taste and Odor in Water,
W79-01739 6B

AUCKLAND (NEW ZEALAND)
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

AUSTRALIA
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

AUSTRIA
Austrian National Report on Non-Waste Technology,
W79-01621 3E

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

AUTOMATION
Problems in Automating the Monitoring of Surface Water Chemistry,
W79-01507 5A

BACTERIA
Bacterial Aerosols from Cooling Towers,
W79-01694 5C

Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

Bdellovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

BALTIMORE
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

BANK EROSION
Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

BANK PROTECTION
A Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1975 Program,
W79-01513 8F

BANK STABILIZATION
Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

BARLEY
Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

BARNSTABLE HARBOR (MASS)
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

BARRIERS
Collapsible and Expansible Barrage,
W79-01869 8A

BASELINE STUDIES
Marine Biological Effects of OCS Petroleum Development,
W79-01788 5C

OCSEAP: An Overview and a Context for Studies on Biological Effects,
W79-01789 5C

Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

Biological Fate of Metals in Fish,
W79-01792 5C

The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of fish Pathology in Alaskan Marine Waters.
W79-01793 5C

Physiological and Behavioral Effects,
W79-01794 5C

Morphology,
W79-01795 5C

Overview,
W79-01796 5C

Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

BASELINE STUDIES

Environmental Assessment of Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol 1, Biological Studies.
W79-01811 5C

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 2,
W79-01820 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 3,
W79-01821 5C

Environmental Assessment of the Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol. 3. Biological Studies.
W79-01822 5C

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet,
W79-01824 5C

Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

BASIN MORPHOLOGY
Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

BATTLE CREEK (CA)
Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

BAYESIAN ANALYSIS
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

BAYLOR COUNTY (TEXAS)
Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

BDELLOVIBRIO
Bdellovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

BEACH EROSION
Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

BEACH PROFILES
Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

BEACHES
On the Excitation of Edge Waves on Beaches,
W79-01914 2L

Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

BEAR BRANCH (TX)
Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

BENEFITS
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

BENT GRASS
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

BENTGRASS
Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

BENTHOS
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

BIBLIOGRAPHIES
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

BIOACCUMULATION
Scientific and Technical Assessment Report on Cadmium,
W79-01756 5A

BIOASSAY
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

BIOCHEMISTRY
Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

BIODEGRADATION
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

BIOINDICATORS
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

Morphological Variation of Elodea in Wester Massachusetts: Field and Laboratory Studies,
W79-01743 5C

BIOLOGICAL COMMUNITIES
Biological Assessment of Water Quality in Large River System: An Evaluation of Method for Fishes,
W79-01553 5A

The Relationship of Biological Population Activated Sludge Plant Performance,
W79-01619 5B

Distribution of Bluegreen Algae in a Mississip Gulf Coast Salt Marsh,
W79-01750 5C

BIOLOGICAL HEALTH OF STREAMS
The West Branch Shabakunk Creek: A Surve lance Report of Physical Conditions and Bi logical Health,
W79-01543 5C

Harry's Brook - A Surveillance Report of Phy cal Conditions and Biological Health,
W79-01907 5C

BIOLOGICAL OXYGEN DEMAND
Report of Waste Source Inventory and Evalu tion, Dade County, Florida.
W79-01834 5C

BIOLOGICAL TREATMENT
Biological Method for Purifying Kraft Pulp M Condensates,
W79-01626 5C

Biodegradation of Phenolic Waste Liquors Stirred-Tank, Packed-Bed, and Fluidized-B Bioreactors,
W79-01762

State of the Art Report on Pesticide Dispo Research,
W79-01764

Removing Toxicity in an Aerated Stabilizat Basin,
W79-01772

The Evolution of Tannery Effluent Treatme Guidelines for Further Investigations,
W79-01780

Apparatus for Purifying Waste Waters,
W79-01880

BIOMASS
A Model for Predicting the Effects of Sew Effluent on Wetland Ecosystems,
W79-01643

BIOTA
Environmental Assessment of the Southeas Bering Sea: Zooplankton and Micronekton,
W79-01816

BIRD CREEK (OK)
Flood Plain Information: Bird Creek and Tr taries, Pawhuska, Oklahoma.
W79-01856

BIRDS
Use of Dredged Material Islands by Colo Seabirds and Wading Birds in New Jersey,
W79-01658

A Comparison of Plant Succession and Utilization on Diked and Undiked Dredged terial Islands in North Carolina Estuaries,
W79-01659

Influence of Petroleum on Egg Formation Embryonic Development in Seabirds,
W79-01802

Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

RMINGHAM (ALA)
Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956 2F

EACH WASTES
Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

EACHING WASTES
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

Biological Impact of Various Chlorinated Phenolics and Related Compounds on Daphnia Magna,
W79-01618 5C

GS
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

TTOM SEDIMENTS
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

WDEN (WVA)
The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

ACKISH WATER
Geochemistry of Ground Water, Southwestern Missouri,
W79-01535 5B

EAKWATERS
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

EEDING
Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

BRICKS
Use in the Brick Industry of Highly Discolored Fibers Recovered from the Final Effluent Clarifier of a Paper Mill (Verwertung von stark verfaerbtem Fangstoff aus der Rest-abwasserklaeranlage einer Papierfabrik in der Ziegelindustrie),
W79-01607 3E

BRIDGE PLUG
How to Insure a Good Bridge Plug Job,
W79-01549 8F

BRITISH COLUMBIA (CANADA)
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

BROILERS
NBC Requests Exemption from Runoff Rules.
W79-01649 5G

BROWN COUNTY (WIS)
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

BUILDING CODES
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

BURROWS
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

CADMIUM
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

Scientific and Technical Assessment Report on Cadmium,
W79-01756 5A

Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

CALIFORNIA
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams,
W79-01588 5B

Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

Flood Hazard Information: Clover Creek, Stillwater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
W79-01851 4A

Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

CANADA
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

CAPE COD
Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

CARBON
Measurement of Total Organic Concentration in Water,
W79-01600 5A

Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

CARBON DIOXIDE
Exchange of Carbon Dioxide Between the Atmosphere and Lake Ontario,
W79-01550 2K

CARBONATE ROCKS
Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

CARCINOGENS
Scientific and Technical Assessment Report on Cadmium,
W79-01756 5A

CATION EXCHANGE
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

CAUSEWAYS
Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

CAVES
The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

Alpha Radiation Monitoring of National Park Service Administered Caves in United States,
W79-01943 2F

Hydrogeology of a Cave Utilized for Public Water Supply: Rio Camuy Cave, Puerto Rico, U.S.A.,
W79-01957 2F

Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

CEMENT PLUG
How to Insure a Good Bridge Plug Job,
W79-01549 8F

CENSUS
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

Remote Sensing of Wetlands,
W79-01642 7B

CENTRIFUGATION
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

CHANNEL FLOW
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

CHANNEL MORPHOLOGY
Ecological Recovery of Realigned Stream Channels,
W79-01515 6G

CHANNEL NETWORK ANALYSIS
Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

CHATTAHOOCHEE RIVER (ALA-GEO)
Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

CHEMICAL PRECIPITATION
Removal of Components from Wastewaters Generated in Textile Finishing Processes. Part II. Separation of Contents from Wastewaters. Size (Eliminierungen von Inhaltsstoffen in Abwassern der Textilveredlung-Teil II Trennung con Abwasser-Inhaltsstoffen, Schlichte,
W79-01757 5D

The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

Removal of Color from Carbonate Pulping Effluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

CHEMICAL PROPERTIES
The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

Solar Photolysis of Water,
W79-01883 2K

Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

CHEMICAL REACTIONS
Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects,
W79-01565 5D

Interaction of Chlorine and Organic Molecules--Effects of Inorganics,
W79-01903 5B

CHEMICAL SPECTRA
A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

CHEMICAL WASTES
Effect of Ozone and Chlorine on 3,4-Benzopyrene During the Disinfection of Water (Deystviye Ozona I Khlora Na 3,4-Benzpiren Priobezzarazhivanii Vody),
W79-01575 5D

Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

CHEMISTRY OF LAKES
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

CHENA RIVER (ALAS)
Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

CHESAPEAKE BAY
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

Microstructure of Agglomerated Suspended Sediments in Northern Chesapeake Bay Estuary,
W79-01923 2L

CHICAGO (ILL)
Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

CHIPPEWA COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

CHLORINATED HYDROCARBON PESTICIDES
Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

CHLORINATED SEWAGE EFFLUENTS
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

CHLORINATION
Effect of Ozone and Chlorine on 3,4-Benzopyrene During the Disinfection of Water (Deystviye Ozona I Khlora Na 3,4-Benzpiren Priobezzarazhivanii Vody),
W79-01575 5D

Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form,
W79-01670 5C

Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

Interaction of Chlorine and Organic Molecules--Effects of Inorganics,
W79-01903 5B

CHLORINE
Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form,
W79-01670 5C

Interaction of Chlorine and Organic Molecules--Effects of Inorganics,
W79-01903 5B

CHROMIUM
The Adsorption of Chromium (VI) at th Oxide/Water Interface,
W79-01514 5

Recovering System for Chrome-Platin Wastewater Containing Chromic Acid (Kurom mekki haisui no shori shisutemu),
W79-01767 5

Rationalization and Environmental Problems Beamhouse Operations,
W79-01778 5

Leather Tanning Industry-Sludge Problen Ahead,
W79-01779 5

CHROMIUM COMPOUNDS
The Adsorption of Chromium (VI) at t Oxide/Water Interface,
W79-01514 5

CICHLIDS
Temperature Requirements of Tilapia Zillii,
W79-01668 5

CITIES
Louisiana Metropolitan Wetlands: A Planni Perspective, A Report to the Louisiana Sta Planning Office,
W79-01650

The Hydrology of Karst Urban Areas,
W79-01948 2

The Roles of Water Conservation Values Community Policy,
W79-01987 3

CITRIC ACID
Citric Acid Enhancement of Copper Sulfa Toxicity to Blue-Green Algae and Other N sance Organisms,
W79-01906

CITY PLANNING
Systematic Development of Institutional a Legal Prescriptions for Urban Water Use a Management,
W79-01891

CLAMS
Feeding and Growth Rates of Polinices Dupli tus Preying on Mya Arenaria at Barnsta Harbor, Massachusetts,
W79-01669

CLASSIFICATION
Wetlands of the United States: Their Extent a Their Value to Waterfowl and Other Wildl
W79-01635

Application of LANDSAT Image Wetl Study and Land Classification in West Tenn see,
W79-01638

The Verification of LANDSAT Data in Geographical Analysis of Wetlands in W Tennessee,
W79-01639

CLAY MINERALOGY
Physical, Chemical, and Mineralogical Prop ties of Fluvial Unconsolidated Bottom S ments in Northwestern Ohio,
W79-01926

CLIMATES
Analysis of Seasonal Persistence of Climat Nebraska,
W79-01538

IMATIC DATA
Crop Water Requirement in Relation to Climate nd Soil,
V79-01712 2G

IMATOLOGY
Solar Radiation and Urban Heat Islands,
V79-01568 2B

OVER CREEK (CA)
Flood Hazard Information: Clover Creek, Still-vater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
V79-01851 4A

AGULATION
Removal of Color from Carbonate Pulping Ef-uent The Calcium-Magnesium Coagulation rocess,
V79-01769 5D

AL CREEK (OK)
lood Plain Information: Coal Creek and Tribu-ries, Henryetta, Oklahoma.
V79-01858 4A

ASTAL MARSHES
se of Landsat Data to Relate Water Depth to bserved Area of Inundation in Coastal arshes,
V79-01637 7B

ASTAL STRUCTURES
oating Breakwaters: An Idea Whose Time Has eturned,
79-01525 8B

ASTAL ZONE MANAGEMENT
mmary Report of the Pilot Study Program, reat Lakes Shoreland Damage Study,
79-01528 4A

inois Coastal Zone Management Program, 2nd ear Work Product, Vol. VI. Public Participa-n Activities by League of Women Voters, ortheastern Illinois Pln. Commission, Lake ichigan Federation.
79-01845 6B

STS
and Land Use Activities and Georgia's Coast-Waters.
79-01651 4C

nois Coastal Zone Management Program, 2nd ar Work Product, Vol. VI. Public Participa-n Activities by League of Women Voters, rtheastern Illinois Pln. Commission, Lake chigan Federation.
79-01845 6B

HRAN COUNTY (TEXAS)
alytical Study of the Ogallala Aquifer in chran County, Texas, Projections of Saturat-Thickness, Volume of Water in Storage, mpage Rates, Pumping Lifts, and Well Yields,
9-01930 7C

O SALMON
e Effects of Intermittent Chlorination on ho Salmon, Alewife, Spottail Shiner, and nbow Smelt,
9-01753 5C

E WASTE ACTIVATED SLUDGE
thod for Adenosine 5'-Triphosphate Mea-ement on Coke Waste Activated Sludge,
9-01723 5D

FORMS
ects of Chlorination on Differentiated Coli-n Groups,
9-01695 5C

COLONIAL BIRDS
Use of Dredged Material Islands by Colonical Seabirds and Wading Birds in New Jersey,
W79-01658 5E

COLOR
Removal of Color from Carbonate Pulping Effluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

COLORADO
Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

Fluvial Adjustments to the Spread of Tamarisk in the Colorado Plateau Region,
W79-01919 2J

The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

COLORADO RIVER
Summer Distribution and Reproductive Status of Fish of the Colorado River in Grand Canyon National Park and Vicinity, 1975,
W79-01585 6B

Investment Planning for Colorado River Salinity Control,
W79-01587 5G

COLUMBIA RIVER
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

COMBINED SEWERS
The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

COMMUNITY DEVELOPMENT
The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

COMPREHENSIVE PLANNING
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

Wabash River Basin Comprehensive Study. Vol I. Main Report,
W79-01830 6B

COMPUTER MODELS
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

Computer Model for Predicting Pollution in the Missouri,
W79-01905 5B

A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

COMPUTER PROGRAMS
Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

COMPUTER STUDIES
A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

CONDENSATES
Characterization of Various Condensate Streams in the Kraft Process,
W79-01601 5D

Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zanieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

CONFERENCES
Sediment Control Conference, Held at Helena Montana on December 15, 1972.
W79-01523 4D

Hydrologic Problems in Karst Regions.
W79-01932 2F

CONNATE WATER
Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

CONNECTICUT
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

CONSERVATION
Summer Distribution and Reproductive Status of Fish of the Colorado River in Grand Canyon National Park and Vicinity, 1975,
W79-01585 6B

The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

CONSTRUCTION
Ecological Recovery of Realigned Stream Channels,
W79-01515 6G

Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

CONTAINMENT AREA
Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

CONTAINMENT AREAS
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

CONTINGENCY PLANNING
Oil and Hazardous Substances Pollution Contingency Plan. Region VIII. Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.
W79-01842 5G

COOLING WATER
Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

Bacterial Aerosols from Cooling Towers,
W79-01694 5C

Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

COPPER
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

COPPER SULFATE
Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5C

Citric Acid Enhancement of Copper Sulfate Toxicity to Blue-Green Algae and Other Nuisance Organisms,
W79-01906 5C

CORE SAMPLERS
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

CORN (FIELD)
Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

CORSON INLET (NJ)
Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

COST ALLOCATION
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

COST ANALYSIS
Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

COST APPORTIONMENT
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

COST-BENEFIT ANALYSIS
Water Resources Appraisal for Hydroelectric Licensing, Kern River Basin, California.
W79-01835 8C

The Upper Columbia Navigation Proposal.
W79-01843 4A

COST COMPARISONS
Remote Sensing of Wetlands,
W79-01642 7B

COST EFFICIENCY
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

COST SHARING
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

COSTS
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

COTTON
Simulation of Nitrogen Processes in Soils for Estimating Fertilizer Requirements,
W79-01713 2K

COTTONWOOD CREEK (CA)
Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

COULOMETRIC TECHNIQUES
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

CRABS
The Influence of Constant and Cyclic Acclimation Temperatures on the Metabolic Rates of Panopeus Herbstii and Uca Pugilator,
W79-01685 5C

CROP PRODUCTION
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

Water Supplies and Costs in Relation to Fa
Resource Decisions and Profits on Sacrame
Valley Farms,
W79-01737

Profile Modification of a Fragiudalf to Incre
Crop Production,
W79-01740

A Methodology for Testing the Accuracy
Yield Predictions from Weather-Yield Reg
sion Models for Corn,
W79-01766

Management of Irrigated Soybeans on a Mo
ately Coarse-Textured Soil in the Upper M
west,
W79-01775

Effects of Corn Stover, Manure, and Nitro
on Soil Properties and Crop Yield,
W79-01781

Fertilizer Placement Effects on Soybean S
Yield, N2 Fixation, and 33P Uptake,
W79-01782

Sunflower Yield and Water Use as Influenced
Planting Date, Population, and Row Spac
W79-01999

CROP RESPONSE
Corn and Alfalfa Production as Influenced
Irrigation and Salinity,
W79-01734

Differential Response of Soybean Varietie
Soil Cadmium,
W79-01826

CRUDE OIL
Effects of Crude Oils on the Growth of A
Marine Phytoplankton,
W79-01784

CULTIVATION
Sunflower Yield and Water Use as Influence
Planting Date, Population, and Row Spac
W79-01999

CYANIDES
Process for Removing Cyanide-Contai
Components from Aqueous Media,
W79-01884

CYANOPHYTA
Distribution of Bluegreen Algae in a Missis
Gulf Coast Salt Marsh,
W79-01750

Citric Acid Enhancement of Copper Su
Toxicity to Blue-Green Algae and Other
sance Organisms,
W79-01906

CYCLES
Nutrient Cycling and Productivity of Dy
phic Lake-Bog Systems (Part A) Appendi
The Influence of Colloidal Organic M
(COM) Upon Iron and Iron-Phosphorus Cy
in an Acid Bog Lake,
W79-01598

DADE COUNTY (FL)
Report of Waste Source Inventory and Ev
tion, Dade County, Florida.
W79-01834

DAM SAFETY PROGRAMS
Remote Sensing Assessment of Dam Floo
Hazards: Methodology Development for
New York State Dam Safety Program,
W79-01980

DAMS
Collapsible and Expansible Barrage,
W79-01869

Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

ANE COUNTY (WISC)
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

APHNIA
Biological Impact of Various Chlorinated Phenolics and Related Compounds on Daphnia Magna,
W79-01618 5C

ARDANELLE RESERVOIR (ARK)
A Preliminary Ecological Survey of Dardanelle Reservoir Prior to Nuclear Facility Effluent Discharge,
W79-01591 6G

ATA COLLECTIONS
Variations in the Duration of Stable Snow Cover in the USSR,
W79-01506 2C

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

TA PROCESSING
Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

TA TRANSMISSION
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

CISION MAKING
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

COLORING
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

COMPOSING ORGANIC MATTER
Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams,
W79-01588 5B

Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

DEEP SEA CORE DRILLING
Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

DELTAS
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

DENITRIFICATION
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

DENSITIFICATION TECHNIQUES
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

DENSITY STRATIFICATION
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

DESALINATION
Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

Water Requirements and Desalting in the United States of America,
W79-01582 3A

Forward Osmosis Extractors: Theory, Feasibility and Design Optimization,
W79-01592 3A

Municipal Water Supply System,
W79-01863 3A

DESALINATION PLANTS
Municipal Water Supply System,
W79-01863 3A

DESERT PLANTS
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

DESIGN
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5G

DESIGN CRITERIA
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

DESIGN FLOOD
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

DESIGN WAVE
Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

DETRITUS
Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams,
W79-01588 5B

DEWATERING
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

Process and Apparatus to Treat Putrefactive Waste from Raw Fish and Meat.
W79-01647 5D

DIAGENESIS
Dolomitization in the Floridan Aquifer,
W79-01749 2F

DIATOMS
Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

DIFFERENTIAL EQUATIONS
A Finite Element Solution to a General Two-Dimensional Nonsymmetric Parabolic Partial Differential Equation,
W79-01559 2G

DIFFUSION
The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

DIGESTION
Filter-Feeding Ethology of Benthic Invertebrates (Ascidians). V. Influence of Temperature on Pumping, Filtration, and Digestion Rates and Rhythms in Phallusia Mamillata,
W79-01653 5C

DIPTERA
Some Effects of Photoperiod, Temperature, and Food on Emergence in Three Species of Chironomidae (Diptera),
W79-01688 5C

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

DIRECTORIES (PERSONNEL)
The Study of Environmental Public Policy: A Preliminary Directory,
W79-01569 6B

DISSOLVED GASES
Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

DISSOLVED OXYGEN
Mathematical Models of Dissolved Oxygen Concentration in Fresh Water,
W79-01998 5C

DISTRIBUTION PATTERNS
Wetland Plant Communities Along the Eastern Shoreline of Lake Ontario,
W79-01644 2I

DIVERSITY INDEX
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

DOLINES
Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2F

Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

DOLOMITE
Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

DOUGLAS COUNTY (WIS)
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

DRAINAGE BASIN ANALYSIS (LAKES)
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

DRAWDOWN
Flow to a Well in an Unconfined Fractured Aquifer,
W79-01953 2F

DREDGED MATERIAL
Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

Use of Dredged Material Islands by Colonical Seabirds and Wading Birds in New Jersey,
W79-01658 5E

A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

DREDGED MATERIAL DISPOSAL
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

DREDGING
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

DRIP IRRIGATION
Mainline Installation,
W79-01689 3F

Drip Irrigation at Superior Farming: Water Use Cut 30%, Fertilizer 50% by This Large Corporate Farm,
W79-01690 3F

DROUGHT TOLERANCE
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

DRYING
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

DUMPING
Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

DYES
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

Organic Impurities from Industrial Waste Water Removal - By Treatment with Activated Carbon Containing Manganese Oxide(s) Useful in Chemical Industry.
W79-01703 5D

Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

ECOLOGICAL DISTRIBUTION
Distribution and Production of Sago Pondweed (Potamogeton Pectinatus L.) on a Northern Prairie Marsh,
W79-01629 2I

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01750 5C

ECOLOGICAL IMPACT
Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

ECOLOGICAL SURVEYS
A Preliminary Ecological Survey of Dardanelle Reservoir Prior to Nuclear Facility Effluent Discharge,
W79-01591 6G

ECOLOGY
Texas Coastal Management Program Ecological Systems Component, User's Manual.
W79-01787 5C

ECONOMIC DEVELOPMENT
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

ECONOMIC FEASIBILITY
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

ECONOMIC IMPACT
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

ECONOMICS
Livestock Farming and Environmental Protec tion, (In German),
W79-01605 5I

Water Supplies and Costs in Relation to Farr Resource Decisions and Profits on Sacrament Valley Farms,
W79-01737 6

Interim Report No. 2, Wabash River Basi Comprehensive Study Covering Reservoir Site on Embarrass River, IL, and Clifty Creek an Patoka River, IN. Vol. II: Appendices A-C
W79-01828 6

Water Resources Appraisal for Hydroelectri Licensing, Kern River Basin, California.
W79-01835 8

Water Conservation in the Las Vegas Valley Pricing and Alternative Measures,
W79-01896 3I

ECOSYSTEM CHARACTERIZATION
Report of a Workshop on the Impact of Therm Power Plant Cooling Systems on Aquatic Env ronments, Vol. I. Working Group Results,
W79-01755 5

ECOSYSTEMS
Design of Field Experiments to Determine th Ecological Effects of Petroleum in Intertid Ecosystems,
W79-01810 5

Trawl Survey of the Epifaunal Invertebrates Norton Sound, Southeastern Chukchi Sea, ar Kotzebue Sound,
W79-01817 5

EFFLUENT
Report of Waste Source Inventory and Evalu tion, Dade County, Florida.
W79-01834 5

EFFLUENTS
Weir Design to Maintain Effluent Quality fro Dredged Material Containment Areas,
W79-01655 5

Public Hearing on the Draft Environmen Impact Statement Relating to Palm Bea County Sewage Treatment Improvement Pr gram.
W79-01839 5

ELECTRICAL CONDUCTANCE
Alternate Drying and Rewetting Effects Chemical and Physical Properties and Moistu Salinity Relationships of a Histosol,
W79-01699 2

ELECTRONIC EQUIPMENT
Remote Sensing of Water Levels in Small-Dia eter Wells,
W79-01924

EMBARRASS RIVER (IL)
Interim Report No. 2, Wabash River Ba Comprehensive Study Covering Reservoir Si on Embarrass River, IL., and Clifty Creek a Patoka River, IN. Vol. III, Appendices D-
W79-01829

EMPLOYMENT
Energy Resources Development in Wyomin Powder River Basin: An Assessment of Poten Social and Economic Impacts,
W79-01545

ENDANGERED SPECIES
Environmental Status of the Lake Michig Region, Volume 11. Natural Areas of the La Michigan Drainage Basin and Endangered Threatened Plant and Animal Species,
W79-01555

ERGY CONVERSION
How They're Harnessing the Sun to Pump Water,
W79-01679 3F

ERGY COSTS
The Impact of Energy Shortage and Cost on rrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

ERGY DEVELOPMENT
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential ocial and Economic Impacts,
W79-01545 6B

GINEERING
nfluence of Karst on Engineering in Ireland,
W79-01973 8G

GLAND
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

The Use of Inclined Boreholes for Well Development,
W79-01503 8B

he 1976 Drought and Nitrate Levels in the iver Exe Basin,
W79-01504 5B

TRAINMENT
eport of a Workshop on the Impact of Thermal ower Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

VIRONMENT
he Study of Environmental Public Policy: A reliminary Directory,
W79-01569 6B

n Economic and Environmental Evaluation of lternative Land Development Around New ampshire Lakes,
W79-01904 5G

arst Hydrology Related to Environmental ensitivity,
W79-01934 2F

VIRONMENTAL EFFECT
he Effects of Highway Construction on the ydrogeologic Environment at Bowden, West irginia,
W79-01975 5B

VIRONMENTAL EFFECTS
he West Branch Shabakunk Creek: A Surveilnce Report of Physical Conditions and Biogical Health,
W79-01543 5C

ffects of Turbidity and Suspended Material in quatic Environments, Literature Review,
W79-01656 5C

he Influence of Constant and Cyclic Acclimaon Temperatures on the Metabolic Rates of nopeus Herbstii and Uca Pugilator,
W79-01685 5C

ptake of Zinc by the Aquatic Larvae of Simum Ornatipes (Diptera: Nematocera),
W79-01696 5C

Biological Assessment of Fish and Benthic pulations Inhabiting a Kraft Mill Effluent annel,
W79-01774 5C

Impact of Offshore Oil and Gas Development on the Coastal Zone: Reforming the Impact Assessment Process,
W79-01783 6G

Texas Coastal Management Program Ecological Systems Component, User's Manual.
W79-01787 5C

An Overview of NOAA's Energy Resources Project on Fate and Effects of Contaminants in Marine Ecosystems and Organisms,
W79-01805 5C

The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 2,
W79-01820 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 3,
W79-01821 5C

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

ENVIRONMENTAL IMPACT ASSESSMENT
Major Element Geochemistry of Lake Powell,
W79-01511 2H

ENVIRONMENTAL IMPACTS
Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

ENZYMES
Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

EQUATIONS (EVAPORATION)
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

EQUILIBRIUM
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling.
W79-01554 5A

EROSION
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

EROSION CONTROL
A Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1975 Program,
W79-01513 8F

Sediment Control Conference, Held at Helena Montana on December 15, 1972.
W79-01523 4D

ESTIMATING
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

ESTUARIES
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

Applications of Mixing Experiments to Estuaries,
W79-01911 2L

ESTUARINE ENVIRONMENT
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

EUTROPHICATION
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

Reclamation of Polluted Farm Ponds,
W79-01988 5G

The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

EVALUATION
Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5A

EVAPORATION
Liquid Waste Processing System,
W79-01890 5D

EVAPORATION CONTROL
Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

EVAPORATION LAKES
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

EVAPOTRANSPIRATION
Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

EXPLOITATION
Current Problems in the Rational Exploitation of Karst Water,
W79-01958 2F

EXPLORATION
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2F

Geophysical Investigations Over Karst Water in Southeastern Missouri,
W79-01942 2F

Hydrogeology of a Cave Utilized for Public Water Supply: Rio Camuy Cave, Puerto Rico, U.S.A.,
W79-01957 2F

Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

FACIES
Dolomitization in the Floridan Aquifer,
W79-01749 2F

FACILITIES
The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

FARM PONDS
Reclamation of Polluted Farm Ponds,
W79-01988 5G

FARM WASTE
Utilization and Disposal of Liquid Manure at Small Available Space, (In German),
W79-01640 5E

FARM WASTES
Livestock Farming and Environmental Protection, (In German),
W79-01605 5D

Liquid Manure and Environment Protection, (In German),
W79-01628 5E

Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

Feedlot Pollution: A Solvable Problem.
W79-01671 5B

FAULTS (GEOLOGIC)
Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

FEASIBILITY STUDIES
The Upper Columbia Navigation Proposal.
W79-01843 4A

FEEDING RATES
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

FEEDLOTS
Feedlot Pollution: A Solvable Problem.
W79-01671 5B

Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

FEEDS
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

FERNS
Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

FERTILIZATION
Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

Effects of Cultural Practices on Grain Yield of Irrigated Wheat,
W79-01761 3F

Relationship Between Soil Test and Small Grain Response to P Fertilization in Field Experiments,
W79-01786 3F

Forage Yield and Fertilizer Recovery by Three Irrigated Perennial Grasses as Affected by N Fertilization,
W79-01885 3F

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

FERTILIZERS
Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

Simulation of Nitrogen Processes in Soils for Estimating Fertilizer Requirements,
W79-01713 2K

Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

FETCH LENGTH
Computing Evaporation for Inland Wate Bodies under a Variety of Fetch and Atmos pheric Stability Conditions,
W79-01895 2I

FIBERBOARD MILLS
Potential for an Improved Return on Investmer in the Production of Wood Fiberboard Usin the Wet Process (Moznosti zvysenia efektivnos vyroby drevovlaknitych dosak mokrym spos bom),
W79-01595 5I

FIBERS (PLANT)
Use in the Brick Industry of Highly Discolore Fibers Recovered from the Final Effluent Clar fier of a Paper Mill (Verwertung von stark ve faerbtem Fangstoff aus der Rest-abwasserklae anlage einer Papierfabrik in der Ziegelindustrie
W79-01607 3

FIELD SPREADING
Liquid Manure and Environment Protection, (I German),
W79-01628 5

FILTERS
Disk Filters for Effluent Purification (Diskov fil'try dlya ochistki stochnykh vod),
W79-01594 5

FILTRATION
Filter-Feeding Ethology of Benthic Invert brates (Ascidians). V. Influence of Temperatu on Pumping, Filtration, and Digestion Rates a Rhythms in Phallusia Mamillata,
W79-01653 5

Liquid Waste Processing System,
W79-01890 5

FINITE DIFFERENCE METHOD
A Finite Element Weighted Residual Solution One-Dimensional Field Problems,
W79-01558 2

FINITE ELEMENT ANALYSIS
Two-Dimensional Unsteady Water Flow in U saturated Porous Media,
W79-01556 2

Transient Two-Dimensional Problems Utilizi the Least Squares Algorithm,
W79-01557 2

A Finite Element Weighted Residual Solution One-Dimensional Field Problems,
W79-01558 2

A Finite Element Solution to a General Tw Dimensional Nonsymmetric Parabolic Part Differential Equation,
W79-01559 2

Finite Element Solution of Two-Dimensio Unsteady and Unsaturated Flow in Poro Media.
W79-01560 2

FISH DISEASES
The Effects of Alaskan Crude Oil on Flatfi and the Prevalence of fish Pathology in Alask Marine Waters.
W79-01793

FISH POPULATIONS
Ecological Recovery of Realigned Stre Channels,
W79-01515 4

Summer Distribution and Reproductive Sta of Fish of the Colorado River in Grand Cany National Park and Vicinity, 1975,
W79-01585

SH REPRODUCTION
Summer Distribution and Reproductive Status of Fish of the Colorado River in Grand Canyon National Park and Vicinity, 1975,
W79-01585 6B

LOATING BREAKWATERS
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

LOCCULATION
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

LOOD CONTROL
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

LOOD DAMAGE REDUCTION
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

LOOD DATA
Flood Plain Information: Salt Creek and Tributaries, Olney, Texas.
W79-01852 4A

Flood Plain Information: Frankstown Branch, Juniata River, Claysburg, Pennsylvania.
W79-01853 4A

Flood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857 4A

Flood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

LOOD FORCASTING
Flood Plain Information: Pigeon Creek, Bentleyville, Fallowfield Township and Somerset Township, Pennsylvania.
W79-01850 4A

LOOD FORECASTING
Flood Hazard Information: Clover Creek, Stillwater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
W79-01851 4A

LOOD FREQUENCY
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

LOOD INSURANCE
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

LOOD PLAIN MANAGEMENT
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

FLOOD PLAIN ZONING
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

FLOOD PROFILES
Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

Flood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857 4A

Flood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

FLOOD PROTECTION
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

FLOOD STAGES
Flood Plain Information: Muddy Branch, Montgomery County Maryland.
W79-01854 4A

FLOODPROOFING
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

FLORAL LISTS
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

FLORIDA
Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

FLOTATION
Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide),
W79-01596 5D

FLOW
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

FLOW CHARACTERISTICS
Indian Creek Pumping Station, Mankato, Minnesota; Hydraulic Model Investigation,
W79-01663 8C

FLOW CONTROL
Flow Control Device for an Irrigation Ditch,
W79-01868 3F

FLOW RATES
Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

FOAM SEPARATION
Toxicity Removed by Foam Separation,
W79-01770 5D

FOOD ABUNDANCE
Some Effects of Photoperiod, Temperature, and Food on Emergence in Three Species of Chironomidae (Diptera),
W79-01688 5C

FOOD CHAINS
Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

FOOD HABITS
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

FORAGE GRASSES
Forage Yield and Fertilizer Recovery by Three Irrigated Perennial Grasses as Affected by N Fertilization,
W79-01885 3F

FORCED CONVECTION
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

FORECASTING
Analysis of Seasonal Persistence of Climate in Nebraska,
W79-01538 2B

Computer Model for Predicting Pollution in the Missouri,
W79-01905 5B

FOREST HABITAT
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

FORMALDEHYDE
Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

FORWARD OSMOSIS
Forward Osmosis Extractors: Theory, Feasibility and Design Optimization,
W79-01592 3A

FRANCE
How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

FREDERICK VALLEY (MD)
Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

FREE CONVECTION
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

FREEZE CONCENTRATION
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

FRESHWATER FISH
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

FRICTION
Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

FRIDAY HARBOR (WASH)
Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

FROUDE NUMBER
Applications of Mixing Experiments to Estuaries,
W79-01911 2L

FROZEN SOILS
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

FUNGAL DEGRADATION
Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547 5E

FUNGI
Mycoflora of Activated Sewage Sludge,
W79-01548 5E

GALERKIN METHOD
A Finite Element Solution to a General Two-Dimensional Nonsymmetric Parabolic Partial Differential Equation,
W79-01559 2G

GALLIONELLA
Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

GAMMA RAYS
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

GAS-TO-LIQUID MASS TRANSFER
Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

GAS-TO-LIQUID TRANSFER
Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects,
W79-01565 5D

GASES
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

GASPARILLA ISLAND (FLA)
Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

GENETICS
Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

GEOCHEMISTRY
Major Element Geochemistry of Lake Powell,
W79-01511 2H

The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

Geochemistry of Ground Water, Southwestern Missouri,
W79-01535 5B

Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

GEOLOGICAL INVESTIGATIONS
Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2F

GEOLOGICAL SURVEYS
Geophysical Investigations Over Karst Water in Southeastern Missouri,
W79-01942 2F

GEOLOGY
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2F

GEOMORPHOLOGY
Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

Karst Topography and Its Occurrence in Kentucky,
W79-01937 2F

Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

Influence of Karst on Engineering in Ireland,
W79-01973 8G

GEORGIA
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

Inland Land Use Activities and Georgia's Coastal Waters.
W79-01651 4C

GEOTHERMAL STUDIES
Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

Geothermal Power and Water Production Studies at the University of California,
W79-01546 3E

GERMANY
Livestock Farming and Environmental Protection, (In German),
W79-01605 5D

GERMINATION
Seedling Emergence as Related to Temperatur and Moisture Tension,
W79-01751 4I

GRAINS (CROPS)
Relationship Between Soil Test and Small Grai Response to P Fertilization in Field Exper ments,
W79-01786 3

GRASSED WATERWAYS
Prediction of Flow Hydraulics for Vegetate Channels,
W79-01726 8

GRASSES
Nutrient Uptake by Grass and Leaching Losse from Soluble and S-Coated Urea and KCl,
W79-01705 3

Seedling Emergence as Related to Temperatur and Moisture Tension,
W79-01751 4I

GRAVELINE BAY MARSH (MISS)
Distribution of Bluegreen Algae in a Mississip Gulf Coast Salt Marsh,
W79-01750 5

Effects of Nutrient Enrichment of a Salt Mars on Diatom Communities,
W79-01982 5

GREAT BRITAIN
Information for Reservoir Control in the North umbrian Water Authority,
W79-01502 4

GREAT EGG HARBOR
Numerical Simulation of Tidal Hydrodynamic Great Egg Harbor and Corson Inlets, Ne Jersey,
W79-01661 2

GREAT LAKES
Summary Report of the Pilot Study Program Great Lakes Shoreland Damage Study,
W79-01528 4

Great Lakes Shoreline Damage Survey, Sai Louis County, Minnesota, Appendix I.
W79-01529 4

Great Lakes Shoreline Damage Survey; Brow Douglas, and Racine Counties, Wisconsin, A pendix II,
W79-01530 4

Great Lakes Shoreline Damage Survey; Musk gon, Manistee, Schoolcraft, Chippewa, Alcon and Huron Counties, Michigan, Appendix II
W79-01531 4

Engineering Studies for a Contract for Fie Investigation of High Water Damage in Osweg County, New York, Appendix IV,
W79-01532 4

Measurement of Coastal Bluff Recession fro Aerial Photographs, Muskegon County, Mich gan, Appendix VII,
W79-01533 4

Comparison of Field Data Collections to Da Collected Using Study Instruments in Muskego and Manistee Counties, Michigan, Append VIII,
W79-01534 4

Design Wave Information for the Great Lake Report 5, Lake Superior,
W79-01662 8

REECE
Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

ROUND TRUTH
Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

ROUNDWATER
Geochemistry of Ground Water, Southwestern Missouri,
W79-01535 5B

Two-Dimensional Unsteady Water Flow in Unsaturated Porous Media,
W79-01556 2G

Finite Element Solution of Two-Dimensional Unsteady and Unsaturated Flow in Porous Media.
W79-01560 2G

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Hydrologic Problems in Karst Regions.
W79-01932 2F

Karst Hydrology Related to Environmental Sensitivity,
W79-01934 2F

Review of the Physical Hydrology of the Central Kentucky Karst,
W79-01938 2F

The Development and Management of Karst Water Resources in the City of Pecs and its Vicinity, Hungary,
W79-01959 2F

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

On the Management of Karst Aquifers in Saudi Arabia,
W79-01962 2F

A Model for Relating Land Use and Groundwater Quality in Southern Missouri,
W79-01964 2F

Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2F

Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

ROUNDWATER BASINS
Review of the Physical Hydrology of the Central Kentucky Karst,
W79-01938 2F

GROUNDWATER MOVEMENT
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

Dolomitization in the Floridan Aquifer,
W79-01749 2F

Model Analysis of Closed Systems in Karstic Aquifers,
W79-01952 2F

Flow to a Well in an Unconfined Fractured Aquifer,
W79-01953 2F

Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

GROUNDWATER POTENTIAL
Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

Current Problems in the Rational Exploitation of Karst Water,
W79-01958 2F

GROUNDWATER PROTECTION
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

GROUNDWATER RECHARGE
Experience in Artificial Ground-Water Recharge for Water Supply in Lithuania,
W79-01508 4B

GROUNDWATER RESOURCES
Dolomitization in the Floridan Aquifer,
W79-01749 2F

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956 2F

Hydrological Problems of Jufra Well Field, Libya,
W79-01963 2F

GROWTH RATES
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival,
W79-01682 5C

GULF OF ALASKA
Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 2,
W79-01820 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 3,
W79-01821 5C

GULF OF MEXICO
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

GYPSUM
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

HABITAT ALTERATION
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

HANFORD ATOMIC RESERVATION (WASH)
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

HARBORS
Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

HARDBOARD MILLS
How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

HARDWOOD
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

HARRY'S BROOK (NJ)
Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

HARVESTING
The Production of Pulp from Marsh Grass.
W79-01630 4A

HAZARDS
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

HEAT FLOW
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

HEATED BIURET-FOLIN METHOD
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

HEAVY METAL ENRICHMENT
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

HEAVY METALS
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

Leather Tanning Industry-Sludge Problems Ahead,
W79-01779 5E

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

Overview,
W79-01796 5C

Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

HIGHWAYS
The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

HISTOSOLS
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

HUDSON RIVER
Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

HUMIC ACIDS
Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

HUNGARY
The Development and Management of Karst Water Resources in the City of Pecs and its Vicinity, Hungary,
W79-01959 2F

HURON COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

HYDRAULIC CONDUCTIVITY
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

HYDRAULIC FRICTION
Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

HYDRAULIC MODELS
Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

HYDRAULIC STRUCTURES
Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

HYDRAULICS
Hydraulics and Stability of Tidal Inlets,
W79-01519 8B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

HYDROCARBONS
Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

HYDROELECTRIC POWER
Water Resources Appraisal for Hydroelectric Licensing, Kern River Basin, California.
W79-01835 8C

HYDROGEN ION CONCENTRATION
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

HYDROGEOLOGY
Hydrologic Problems in Karst Regions.
W79-01932 2F

Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2F

Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

Hydrogeology of a Cave Utilized for Public Water Supply: Rio Camuy Cave, Puerto Rico U.S.A.,
W79-01957 2F

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

HYDROGRAPH ANALYSIS
Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II Validation Studies,
W79-01947 2A

HYDROLOGIC CYCLE
Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I Model Structure,
W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II Validation Studies,
W79-01947 2A

HYDROLOGIC MODELS
Hydrologic Interpretation of Basin Morphology
W79-01899 2A

HYDROLOGY
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F
W79-01829 6E

IDAHO
Incentives for Improved Water-Use Efficiency Implementation Phase,
W79-01836 3F

ILLINOIS
Illinois Coastal Zone Management Program, 2nd Year Work Product, Vol. VI. Public Participation Activities by League of Women Voters Northeastern Illinois Pln. Commission, Lake Michigan Federation.
W79-01845 6E

Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5E

IMPACT ASSESSMENT
Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

INCENTIVES
Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

INCINERATION
State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

INDIAN CREEK PUMPING STATION (MINN)
Indian Creek Pumping Station, Mankato, Minnesota; Hydraulic Model Investigation,
W79-01663 8C

INDIANA
A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

ystematic Development of Institutional and egal Prescriptions for Urban Water Use and Ianagement,
V79-01891 6E

ummary of Geohydrologic Relationships in the ost River Watershed, Indiana, Applied to Vater Use and Environment,
V79-01939 2F

DUSTRIAL WASTES

ffect of Ozone and Chlorine on 3,4-Benzopyrne During the Disinfection of Water (Deystiye Ozona I Khlora Na 3,4-Benzpiren Priobezarazhivanii Vody),
V79-01575 5D

xamination of the Problem of Recuperative reatment of Waste Water in the Chemical Industry (Consideratii Asupra Problemei Epurari ecuperative A Apelor Reziduale),
V79-01579 5D

lean Up Mixed Waste Streams -- The Tank ruck Washing Example.
V79-01583 5D

anawha River Investigation of Water Quality nd Water Pollution Control Practices. Volume : Reports of Industrial Investigations on Seven ndustries.
V79-01654 5D

rganic Impurities from Industrial Waste Water emoval - By Treatment with Activated Carbon ontaining Manganese Oxide(s) Useful in hemical Industry.
V79-01703 5D

ow to Conduct a Wastewater Survey: Part II - eveloping Waste Stream Profiles,
V79-01760 5G

iodegradation of Phenolic Waste Liquors in tirred-Tank, Packed-Bed, and Fluidized-Bed ioreactors,
V79-01762 5D

efinery Cyanides: A Regulatory Dilemma,
V79-01763 5D

tate of the Art Report on Pesticide Disposal esearch,
V79-01764 5E

emoval of Color from Carbonate Pulping Effuent The Calcium-Magnesium Coagulation rocess,
V79-01769 5D

etermination of Polychlorinated Biphenyls in aper Mill Effluents - The Influence of Suspendd Solids,
V79-01771 5A

tatus of the Closed-Cycle Concept Kraft Mill t Great Lakes Paper Co.,
V79-01773 3E

olor Removal from Textile Dye Waste Using Iagnesium Carbonate,
V79-01776 5D

eather Tanning Industry-Sludge Problems head,
V79-01779 5E

eport of Waste Source Inventory and Evaluaion, Dade County, Florida.
V79-01834 5G

rocess for the Purification of Industrial Effluents,
V79-01874 5D

Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

Apparatus for Purifying Waste Waters,
W79-01880 5D

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

INDUSTRIAL WATER

Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

Rationalization and Environmental Problems of Beamhouse Operations,
W79-01778 5D

INFILTRATION

A Method of Promoting Penetration of Water into Tight, Sloping Soil Under Drip Irrigation,
W79-01719 3F

INFILTRATION RATES

The Use of Nonionic Surfactants on Soils,
W79-01571 2G

INFILTROMETERS

Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

INJECTION WELLS

Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

INLETS (WATERWAYS)

Hydraulics and Stability of Tidal Inlets,
W79-01519 8B

Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

INSTITUTIONS

Karstic Institutional Conflicts and Opportunities,
W79-01935 6E

INSTRUMENTATION

Problems in Automating the Monitoring of Surface Water Chemistry,
W79-01507 5A

Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

INTERACTIVE COMPUTER SYSTEMS

Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

INTERCELLULAR SPACES

Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

INTERNATIONAL HYDROLOGICAL DECADE

United States Participation in the International Hydrological Program 1975-.
W79-01509 2A

INTERNATIONAL HYDROLOGICAL PROGRAM

United States Participation in the International Hydrological Program 1975-.
W79-01509 2A

INTERTIDAL AREAS

Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet,
W79-01824 5C

Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

INTESTINAL MICROFLORA

Bdellovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

INVERTEBRATES

Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chukchi Sea, and Kotzebue Sound,
W79-01817 5C

INVESTMENT

Sequencing Competitive Expansion Projects,
W79-01561 6A

ION EXCHANGE

Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

IOWA

Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2F

IRELAND

Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

Influence of Karst on Engineering in Ireland,
W79-01973 8G

IRON

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

IRON BACTERIA

Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

IRON COMPOUNDS

The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

IRRIGATION

Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

A Method of Promoting Penetration of Water into Tight, Sloping Soil Under Drip Irrigation,
W79-01719 3F

Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

Trickle Emitter for Subterranean Irrigation,
W79-01860 3F

Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

Flow Control Device for an Irrigation Ditch,
W79-01868 3F

Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

Regulated Flow-Reducing Device Particularly Useful for Drip Irrigation,
W79-01882 3F

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

Early Conflicts Over Effluent Irrigation in Missouri's Ozarks,
W79-01971 6E

Subsurface Water Behavior and Sewage Effluent Irrigation in the Missouri Ozarks,
W79-01972 5B

IRRIGATION DESIGN
An Introduction to Emission Uniformity,
W79-01686 8B

IRRIGATION DITCHES
Flow Control Device for an Irrigation Ditch,
W79-01868 3F

IRRIGATION EFFECTS
The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

IRRIGATION EFFICIENCY
Drip Irrigation at Superior Farming: Water Use Cut 30%, Fertilizer 50% by This Large Corporate Farm,
W79-01690 3F

Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

IRRIGATION ENGINEERING
[illegible] 8B

IRRIGATION PRACTICES
Sprinkler Irrigation Practices and Water Losses: Water Shortages Underline Need for Conservation,
W79-01673 3F

Drip Irrigation at Superior Farming: Water Use Cut 30%, Fertilizer 50% by This Large Corporate Farm,
W79-01690 3F

Regulated Flow-Reducing Device Particularly Useful for Drip Irrigation,
W79-01882 3F

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

IRRIGATION PROGRAMS
Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

IRRIGATION SYSTEMS
An Introduction to Emission Uniformity,
W79-01686 8B

Mainline Installation,
W79-01689 3F

World's Largest Solar-Powered Irrigation System Operating in Arizona: Rising Energy Costs Cause Exploratory Venture.
W79-01692 3F

Trickle Emitter for Subterranean Irrigation,
W79-01860 3F

Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

ISLANDS
Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

Use of Dredged Material Islands by Colonical Seabirds and Wading Birds in New Jersey,
W79-01658 5E

A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

JACCARD SIMILARITY COEFFICIENT
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

JAMAICA
Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

JAMES RIVER (SD)
Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

JOJOBA
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

JOPLIN (MO)
Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

JUNIATA RIVER (PA)
Flood Plain Information: Frankstown Branch Juniata River, Claysburg, Pennsylvania.
W79-01853 4

KANAWHA RIVER
Kanawha River Investigation of Water Quality and Water Pollution Control Practices. Volume II: Reports of Industrial Investigations on Several Industries.
W79-01654 5

KANSAS
Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5

KARST
Hydrologic Problems in Karst Regions.
W79-01932 2

Karstic Institutional Conflicts and Opportunities
W79-01935 6

A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2

Karst Topography and Its Occurrence in Kentucky,
W79-01937 2

A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2

The A, B, C's of Finding and Delineating Cavities with Apparent Resistivity Measurements,
W79-01941 2

Geophysical Investigations Over Karst Water in Southeastern Missouri,
W79-01942 2

Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2

Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2

Storage Properties of Fractured Formations,
W79-01950 2

Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement
W79-01951 2

Model Analysis of Closed Systems in Karst Aquifers,
W79-01952 2

Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2

Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2

Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956 2

The Development and Management of Karst Water Resources in the City of Pecs and Its Vicinity, Hungary,
W79-01959 2

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2

Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

On the Management of Karst Aquifers in Saudi Arabia,
W79-01962 2F

Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

Influence of Karst on Engineering in Ireland,
W79-01973 8G

Construction Methods which Recognize the Mechanics of Sinkhole Development,
W79-01974 8G

The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

ARST HYDROLOGY
Hydrologic Problems in Karst Regions.
W79-01932 2F

Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

Karst Hydrology Related to Environmental Sensitivity,
W79-01934 2F

Review of the Physical Hydrology of the Central Kentucky Karst,
W79-01938 2F

Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

The Hydrology of Karst Urban Areas,
W79-01948 2A

Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2F

Current Problems in the Rational Exploitation of Karst Water,
W79-01958 2F

A Model for Relating Land Use and Groundwater Quality in Southern Missouri,
W79-01964 2F

Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2F

Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

RSTS
Flow to a Well in an Unconfined Fractured Aquifer,
W79-01953 2F

KENTUCKY
Karst Topography and Its Occurrence in Kentucky,
W79-01937 2F

Review of the Physical Hydrology of the Central Kentucky Karst,
W79-01938 2F

Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

KERN RIVER BASIN (CA)
Water Resources Appraisal for Hydroelectric Licensing, Kern River Basin, California.
W79-01835 8C

KINETICS
Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

KINGS MOUNTAIN (NC)
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

KOOTENAI RIVER (MONT)
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

KRAFT MILLS
Characterization of Various Condensate Streams in the Kraft Process,
W79-01601 5D

Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zanieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

Reduction of the Water-Polluting Discharges from a Bleached Sulfate Pulp Mill (Reduction de la charge de pollution de l'eau provenant d'une usine de pate au sulfate blanchie),
W79-01625 5D

LABORATORY TESTS
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

LAKE CARL BLACKWELL (OKLA)
Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

LAKE CHARLES (LA)
A Land Study for Downtown Lake Charles,
W79-01838 6B

LAKE ERIE
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

LAKE HURON
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

LAKE MICHIGAN
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

LAKE MICHIGAN BASIN
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

LAKE MICHIGAN (IL)
Illinois Coastal Zone Management Program, 2nd Year Work Product, Vol. VI. Public Participation Activities by League of Women Voters, Northeastern Illinois Pln. Commission, Lake Michigan Federation.
W79-01845 6B

LAKE MORPHOLOGY
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

LAKE ONTARIO
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Engineering Studies for a Contract for Field Investigation of High Water Damage in Oswego County, New York, Appendix IV,
W79-01532 4A

Exchange of Carbon Dioxide Between the Atmosphere and Lake Ontario,
W79-01550 2K

Wetland Plant Communities Along the Eastern Shoreline of Lake Ontario,
W79-01644 2I

Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

LAKE POWELL (UTAH)
Major Element Geochemistry of Lake Powell,
W79-01511 2H

LAKE RESTORATION
Reclamation of Polluted Farm Ponds,
W79-01988 5G

LAKE SEDIMENTS
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

LAKE SHORE PROTECTION
Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

LAKE SHORES
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Engineering Studies for a Contract for Field Investigation of High Water Damage in Oswego County, New York, Appendix IV,
W79-01532 4A

Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

LAKE SUPERIOR
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

LAKES
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

Submerged Vegetation of the Rotorua and Waikato Lakes 3. Lake Rerewhakaiitu,
W79-01652 2H

Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

An Unobtrusive Measure of the Recreational Value of a Lake,
W79-01986 6B

LAND MANAGEMENT
Inland Land Use Activities and Georgia's Coastal Waters.
W79-01651 4C

LAND SUBSIDENCE
Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

LAND USE
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee,
W79-01638 7B

The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

LANDFILLS
Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

LANDSAT DATA
The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

LARVAL GROWTH STAGE
The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

LAS VEGAS VALLEY (NEV)
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

LATENT HEAT
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

LEACHATE
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

LEACHING
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5E

Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

Effect of Soil Mixtures and Irrigation Method on Leaching of N in Golf Greens,
W79-01777 5F

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

LEAD
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

LEAST SQUARES METHOD
Transient Two-Dimensional Problems Utilizing the Least Squares Algorithm,
W79-01557 2C

LEECHES
Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard)
W79-01700 5C

LEGAL ASPECTS
Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6B

LEGISLATION
Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5C

Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6B

Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6B

LIBYA
Hydrological Problems of Jufra Well Field Libya,
W79-01963 2F

LIME
The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

LIMESTONES
Dolomitization in the Floridan Aquifer,
W79-01749 2F

IQUID WASTES
Liquid Manure and Environment Protection, (In German),
W79-01628 5E

Utilization and Disposal of Liquid Manure at Small Available Space, (In German),
W79-01640 5E

ITTORAL
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

IVESTOCK
Livestock Farming and Environmental Protection, (In German),
W79-01605 5D

OAM
Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

OCATING
The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

OST RIVER (INDIANA)
Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

OUISIANA
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

UBBOCK COUNTY (TEXAS)
Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

YSIMETERS
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

ADISON METROPOLITAN SEWERAGE ISTRICT (WISC)
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

AGNESIUM CARBONATE
Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

AINE
Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

AJOR ELEMENT GEOCHEMISTRY
Major Element Geochemistry of Lake Powell,
W79-01511 2H

ANAGEMENT
Management of Local Water Systems in Alabama,
W79-01536 6E

Illinois Coastal Zone Management Program, 2nd Year Work Product, Vol. VI. Public Participation Activities by League of Women Voters, Northeastern Illinois Pln. Commission, Lake Michigan Federation.
W79-01845 6B

MANAGEMENT (ADMINISTRATIVE)
Innovative Management Concept for 208 Planning,
W79-01848 5G

MANGANESE
Organic Impurities from Industrial Waste Water Removal - By Treatment with Activated Carbon Containing Manganese Oxide(s) Useful in Chemical Industry.
W79-01703 5D

MANISTEE COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

MAPPING
Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes,
W79-01637 7B

Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

MARINE ALGAE
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

MARKING
Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

MARSH MANAGEMENT
Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife,
W79-01635 6B

Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

MARSHES
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

MARYLAND
Flood Plain Information: Muddy Branch, Montgomery County Maryland.
W79-01854 4A

Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

MASS SPECTROSCOPY
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

MASS TRANSFER
Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects,
W79-01565 5D

Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

MASS TRANSFER MODEL
Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

MASSACHUSETTS
Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

Morphological Variation of Elodea in Western Massachusetts: Field and Laboratory Studies,
W79-01743 5C

The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

MATHEMATICAL MODEL
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W79-01643 5C

MATHEMATICAL MODELS
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

Sequencing Competitive Expansion Projects,
W79-01561 6A

Investment Planning for Colorado River Salinity Control,
W79-01587 5G

Ralston Creek Hourly Precipitation Model,
W79-01727 2B

Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

Applications of Mixing Experiments to Estuaries,
W79-01911 2L

Mathematical Models of Dissolved Oxygen Concentration in Fresh Water,
W79-01998 5C

MATHEMATICAL STUDIES
A Finite Element Solution to a General Two-Dimensional Nonsymmetric Parabolic Partial Differential Equation,
W79-01559 2G

Sequencing Competitive Expansion Projects,
W79-01561 6A

Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

MAUMEE RIVER (OHIO)
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

MEASUREMENT
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

MEAT PROCESSING WASTES
Process and Apparatus to Treat Putrefactive Waste from Raw Fish and Meat.
W79-01647 5D

MECHANICAL EQUIPMENT
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

MEMBRANE PROCESSES
Forward Osmosis Extractors: Theory, Feasibility and Design Optimization,
W79-01592 3A

Studies of Membrane Processes for Pulp Mill Pollution Control,
W79-01611 5D

MERCURY
Controlled Ecosystem Pollution Experiment: Effect of Mercury on Enclosed Water Columns. VIII. Summary of Results,
W79-01691 5C

The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

METABOLISM
The Influence of Constant and Cyclic Acclimation Temperatures on the Metabolic Rates of Panopeus Herbstii and Uca Pugilator,
W79-01685 5C

Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

METALS
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

METERING
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

METHODOLOGY
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

MICHIGAN
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

MICROBIAL DEGRADATION
Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

MICRONEKTON
Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

MICROORGANISMS
Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

MILLERS RIVER (MASS)
Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

MINERALOGICAL PROPERTIES
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

MINERALOGY
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

MINNESOTA
Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

Indian Creek Pumping Station, Mankato, Minnesota; Hydraulic Model Investigation,
W79-01663 8C

MINNESOTA RIVER BASIN
Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

MISSISSIPPI
The Salt Marsh Flora of Mississippi,
W79-01632 2I

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01750 5C

Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

MISSISSIPPI RIVER
A Study of Articulated Concrete Revetmer Mattress: Test and Analysis--Results of FY 197 Program,
W79-01513 8I

MISSISSIPPI WATER SYSTEMS
Model Aids Managerial Effectiveness in Munic pal Water Systems,
W79-01741 5C

MISSOURI
Geochemistry of Ground Water, Southwester Missouri,
W79-01535 5I

Computer Model for Predicting Pollution in th Missouri,
W79-01905 5I

Geophysical Investigations Over Karst Water i Southeastern Missouri,
W79-01942 2I

A Model for Relating Land Use and Ground water Quality in Southern Missouri,
W79-01964 2I

Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5I

Early Conflicts Over Effluent Irrigation in Mi souri's Ozarks,
W79-01971 6I

Subsurface Water Behavior and Sewage Effl ent Irrigation in the Missouri Ozarks,
W79-01972 5I

Construction Methods which Recognize the Me chanics of Sinkhole Development,
W79-01974 8G

MISSOURI OZARKS
A Model for Relating Land Use and Ground water Quality in Southern Missouri,
W79-01964 2I

Early Conflicts Over Effluent Irrigation in Mi souri's Ozarks,
W79-01971 6I

Subsurface Water Behavior and Sewage Effl ent Irrigation in the Missouri Ozarks,
W79-01972 5I

MIXING
Applications of Mixing Experiments to Estu aries,
W79-01911 2I

MOBILE BAY (ALA)
Water Resources Planning for Rivers Drainin into Mobile Bay,
W79-01510 4A

MODEL STUDIES
The Use of Inclined Boreholes for Well Devel opment,
W79-01503 8I

Simulation of Fluid-Rock Interactions in a Geo thermal Basin,
W79-01516 2I

Effects of Construction of Liberty State Park o Hydraulic Characteristics of New York Harbor Hydraulic Model Investigation,
W79-01518 8I

Application of Remote Sensing in Estimatin Evapotranspiration in the Platte River Basin
W79-01521 7I

Conceptual and Mathematical Modeling of th Hanford Groundwater Flow Regime,
W79-01522 5I

hree-Dimensional Flow Simulation in Estu-ies,
/79-01524 2L

loating Breakwater Field Assessment Program, riday Harbor, Washington,
/79-01526 8B

nalysis of Seasonal Persistence of Climate in ebraska,
/79-01538 2B

equencing Competitive Expansion Projects,
/79-01561 6A

ertilization Decision Model-A Synthesis of Soil nd Plant Parameters in a Computerized Pro-am,
/79-01714 2G

alston Creek Hourly Precipitation Model,
/79-01727 2B

ne Timeliness Benefit of Subsurface Drainage,
/79-01728 3F

ecision Making in a Multiple-Use Approach to e Reclamation of Strip-Mined Lands,
/79-01730 5G

odel Aids Managerial Effectiveness in Munici-l Water Systems,
/79-01741 5G

Methodology for Testing the Accuracy of eld Predictions from Weather-Yield Regres-on Models for Corn,
/79-01766 3F

ne Impact of Energy Shortage and Cost on rigation for the High Plains and Trans Pecos egions of Texas,
/79-01894 3F

mputer Model for Predicting Pollution in the issouri,
/79-01905 5B

the Excitation of Edge Waves on Beaches,
/79-01914 2L

r-Regulated Siphon Spillways at Spelga Dam,
/79-01925 8B

merical Simulation of Watershed Response ing the Unified Transport Model - Part I. odel Structure,
/79-01946 2A

merical Simulation of Watershed Response ing the Unified Transport Model - Part II. lidation Studies,
/79-01947 2A

e Hydrology of Karst Urban Areas,
/79-01948 2A

nceptual Models for Carbonate Aquifers: Re-ited,
/79-01949 2F

orage Properties of Fractured Formations,
/79-01950 2F

odel Analysis of Closed Systems in Karstic uifers,
/79-01952 2F

ow to a Well in an Unconfined Fractured uifer,
/79-01953 2F

Model for Relating Land Use and Ground-ter Quality in Southern Missouri,
/79-01964 2F

MOISTURE CONTENT
Linearized Moisture Flow with Loss at the Soil Surface,
W79-01704 2G

MOISTURE TENSION
Root-Sink Descriptions of Water Supply to Dry-land Wheat,
W79-01732 3F

Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

MOISTURE UPTAKE
Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

MOLLUSKS
The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

MONITORING
Development of Technique for Detection of Low Molecular Weight Contaminant in Product Water from Water Purification or Water Reuse Systems,
W79-01578 5A

Alpha Radiation Monitoring of National Park Service Administered Caves in United States,
W79-01943 2F

Subsurface Water Behavior and Sewage Effluent Irrigation in the Missouri Ozarks,
W79-01972 5B

MONOAMINES
The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

MONOMOLECULAR FILMS
Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

MONROE COUNTY (W VA)
Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

MONTANA
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

Montana's Water Resources: A Research Trust.
W79-01541 6E

Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

MORPHOEDAPHIC INDICES (LAKES)
Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

MORPHOLOGY
Morphology,
W79-01795 5C

Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

MORTALITY
Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival,
W79-01682 5C

MOSQUITOES
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

MOVABLE-BED MODELS
Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

MUDDY BRANCH (MD)
Flood Plain Information: Muddy Branch, Montgomery County Maryland.
W79-01854 4A

MULTIPLE-PURPOSE PROJECTS
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

Water Resources Appraisal for Hydroelectric Licensing, Kern River Basin, California.
W79-01835 8C

MULTIPLE-PURPOSE RESERVOIRS
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

MULTIPURPOSE RESERVOIRS
Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

MUNICIPAL WATER SYSTEMS
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

MUSKEGON COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

MUSSELS
Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

MUTANTS
Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

MYCOFLORA
Mycoflora of Activated Sewage Sludge,
W79-01548 5E

MYRIOPHYLLUM HETEROPHYLLUM
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

NATIONAL INCOME
The Upper Columbia Navigation Proposal.
W79-01843 4A

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NBC Requests Exemption from Runoff Rules.
W79-01649 5G

NATURAL AREAS
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

NATURAL RESOURCES
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

Influence of Karst on Engineering in Ireland,
W79-01973 8G

NAVIGATION CHANNELS
Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

NAVIGATION CONDITIONS
Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

NEBRASKA
Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

Analysis of Seasonal Persistence of Climate in Nebraska.
W79-01538 2B

NEVADA
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

NEW HAMPSHIRE
An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

NEW JERSEY
Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

Use of Dredged Material Islands by Colonical Seabirds and Wading Birds in New Jersey,
W79-01658 5E

Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

NEW YORK
Engineering Studies for a Contract for Field Investigation of High Water Damage in Oswego County, New York, Appendix IV,
W79-01532 4A

The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

NEW YORK HARBOR
Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

NEW ZEALAND
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

NIAGARA RIVER
Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

NITRAPYRIN
Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

NITRATES
The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

Simulation of Nitrogen Processes in Soils for Estimating Fertilizer Requirements,
W79-01713 2K

Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

NITRIFICATION
Nitrapyrin Degradation and Movement in Soil
W79-01706 2G

Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

NITRITES
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

NITROGEN
Nitrapyrin Degradation and Movement in Soil
W79-01706 2G

Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

Effects of Cultural Practices on Grain Yield of Irrigated Wheat,
W79-01761 3F

A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

Nitrogen Release Characteristics of Isobutylidene Diurea and its Effectiveness as a Source of N for Flue-Cured Tobacco,
W79-01841 3F

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

TROGEN COMPOUNDS
Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

TROGEN FIXATION
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

TROUS OXIDE
Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

N-STRUCTURAL ALTERNATIVES
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

lood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

lood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

NPATHOGENIC BACTERIA
desulfovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

NSTRUCTURAL ALTERNATIVE
hysical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

RTH CAROLINA
Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

eochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

RTH GATE LAKE (MI)
utrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

utrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

RTH SLOPE BOROUGH (AK)
orth Slope Borough Water Study, A Background for Planning,
W79-01991 5D

RTHERN REGION (ALAS)
lood Frequency Design in Sparse-Data Regions,
W79-01901 4A

MERICAL SIMULATION
umerical Simulation of Tidal Hydrodynamics, reat Egg Harbor and Corson Inlets, New rsey,
W79-01661 2L

TRIENT INACTIVATION
eclamation of Polluted Farm Ponds,
W79-01988 5G

NUTRIENT REMOVAL
Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

NUTRIENTS
Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

OAHE IRRIGATION PROJECT (SD)
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

OCEAN WAVES
On the Excitation of Edge Waves on Beaches,
W79-01914 2L

OCEANS
Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

ODOR
Consumer Attitudes Toward Taste and Odor in Water,
W79-01739 6B

OGALLALA AQUIFER (TEXAS)
Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

OGALLALA FORMATION
Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

OHIO
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

OIL INDUSTRY
Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

OIL POLLUTION
Impact of Offshore Oil and Gas Development on the Coastal Zone: Reforming the Impact Assessment Process,
W79-01783 6G

Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

Marine Biological Effects of OCS Petroleum Development,
W79-01788 5C

OCSEAP: An Overview and a Context for Studies on Biological Effects,
W79-01789 5C

Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

Biological Fate of Metals in Fish,
W79-01792 5C

The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of fish Pathology in Alaskan Marine Waters.
W79-01793 5C

Physiological and Behavioral Effects,
W79-01794 5C

Morphology,
W79-01795 5C

Overview,
W79-01796 5C

Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

Activity-Directed Fractionation of Petroleum,
W79-01799 5C

Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

Influence of Petroleum on Egg Formation and Embryonic Development in Seabirds,
W79-01802 5C

Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

An Overview of NOAA's Energy Resources Project on Fate and Effects of Contaminants in Marine Ecosystems and Organisms,
W79-01805 5C

Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5C

Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

Environmental Assessment of Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol 1, Biological Studies.
W79-01811 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Oil and Hazardous Substances Pollution Contingency Plan. Region VIII. Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.
W79-01842 5G

Adsorbent Process for Oily Materials,
W79-01864 5G

Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

Oil Spill Retrieval System,
W79-01889 5G

Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

OIL RECOVERY

Oil Spill Retrieval System,
W79-01889 5G

OIL SPILLS

Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

Oil and Hazardous Substances Pollution Contingency Plan. Region VIII. Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.
W79-01842 5G

Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

Oil Spill Retrieval System,
W79-01889 5G

Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

OIL WASTES

Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

OILY WATER

Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

OKLAHOMA

Flood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

Flood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

ON-SITE DATA COLLECTIONS

The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

How to Conduct a Wastewater Survey: Part II - Developing Waste Stream Profiles,
W79-01760 5G

Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

ON-SITE TESTS

The Use of Inclined Boreholes for Well Development,
W79-01503 8B

Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

Hydrological Problems of Jufra Well Field, Libya,
W79-01963 2F

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

OPERATION AND MAINTENANCE

Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

OPTIMIZATION

Sequencing Competitive Expansion Projects,
W79-01561 6A

Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

Forward Osmosis Extractors: Theory, Feasibility and Design Optimization,
W79-01592 3A

On Optimal Regulation Policies for Certai Multi-Reservoir Systems,
W79-01731 4A

OREGON

Ecological Recovery of Realigned Strea Channels,
W79-01515 6C

Floating Breakwaters: An Idea Whose Time Ha Returned,
W79-01525 8I

Seasonal Variation in Beach Erosion and Sed mentation on the Oregon Coast,
W79-01920 2

ORGAN CAVE (WVA)

A Preliminary Investigation on Seismic Tech niques Used to Locate Cavities in Karst Te rains,
W79-01940 2

ORGANIC ACIDS

Influence of K on the Uptake, Translocatio and Reduction of Nitrate by Barley Seedling
W79-01693 3

ORGANIC COMPOUNDS

Measurement of Total Organic Concentration i Water,
W79-01600 5A

ORGANIC LOADING

An Economic and Environmental Evaluation o Alternative Land Development Around Ne Hampshire Lakes,
W79-01904 5C

ORGANIC MATTER

Effects of Corn Stover, Manure, and Nitroge on Soil Properties and Crop Yield,
W79-01781 3

ORGANIC MOLECULES

Interaction of Chlorine and Organic Molecules Effects of Inorganics,
W79-01903 5

ORGANIC SOILS

Alternate Drying and Rewetting Effects o Chemical and Physical Properties and Moistur Salinity Relationships of a Histosol,
W79-01699 2C

ORGANIC WASTES

Predicting the Anaerobic Degradation of Orga ic Chemical Pollutants in Waste Water Trea ment Plants from Their ELectrochemical R duction Behavior,
W79-01539 5

ORTHOPHOSPHATES

Factors Affecting Sediment Phosphorus Relea in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

OSMOSIS

Forward Osmosis Extractors: Theory, Feasibi ity and Design Optimization,
W79-01592 3A

OSMUNDA REGALIS

Genetic Damage to a Fern Population Growin in a Polluted Environment: Segregation and De scription of Gametophyte Mutants,
W79-01745 5C

OSWEGO COUNTY (NY)

Engineering Studies for a Contract for Fiel Investigation of High Water Damage in Oswe County, New York, Appendix IV,
W79-01532 4A

OUTE CONTINENTAL SHELF

Sublethal Effects of Petroleum Hydrocarbon and Trace Metals Including Biotransformation

as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

UTER CONTINENTAL SHELF
Impact of Offshore Oil and Gas Development on the Coastal Zone: Reforming the Impact Assessment Process,
W79-01783 6G

Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

Texas Coastal Management Program Ecological Systems Component, User's Manual.
W79-01787 5C

Marine Biological Effects of OCS Petroleum Development,
W79-01788 5C

OCSEAP: An Overview and a Context for Studies on Biological Effects,
W79-01789 5C

Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Biological Fate of Metals in Fish,
W79-01792 5C

The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of fish Pathology in Alaskan Marine Waters.
W79-01793 5C

Physiological and Behavioral Effects,
W79-01794 5C

Morphology,
W79-01795 5C

Overview,
W79-01796 5C

Transport, Retention, and Effects of the Water-soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

Activity-Directed Fractionation of Petroleum,
W79-01799 5C

Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

Influence of Petroleum on Egg Formation and Embryonic Development in Seabirds,
W79-01802 5C

Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

An Overview of NOAA's Energy Resources Project on Fate and Effects of Contaminants in Marine Ecosystems and Organisms,
W79-01805 5C

The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5C

Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

Environmental Assessment of Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol 1, Biological Studies.
W79-01811 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chukchi Sea, and Kotzebue Sound,
W79-01817 5C

Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 2,
W79-01820 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 3,
W79-01821 5C

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet,
W79-01824 5C

Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

OXIDATION
Trickle-Bed Reactor Performance, Part II: Reaction Studies,
W79-01566 5D

Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores,
W79-01572 5D

The Evolution of Tannery Effluent Treatment--Guidelines for Further Investigations,
W79-01780 5D

OXIDATION LAGOONS
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

OXIDATION-REDUCTION POTENTIAL
Predicting the Anaerobic Degradation of Organic Chemical Pollutants in Waste Water Treatment Plants from Their ELectrochemical Reduction Behavior,
W79-01539 5B

OZONE
Effect of Ozone and Chlorine on 3,4-Benzopyrene During the Disinfection of Water (Deystviye Ozona I Khlora Na 3,4-Benzpiren Priobezzarazhivanii Vody),
W79-01575 5D

UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

'Oxyphotolysis' -- Process for Effluent Contaminants,
W79-01604 5D

State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

PACIFIC OCEAN
Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

PACKED BEDS
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

PALM BEACH COUNTY (FL)
Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

PANTHER BRANCH (TX)
Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

PARAMETERS
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

PARTIAL-AREA RESPONSE
Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

PARTICLE SIZE
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

PARTICULATES
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

PATENTS
Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide),
W79-01596 5D

Organic Impurities from Industrial Waste Water Removal - By Treatment with Activated Carbon Containing Manganese Oxide(s) Useful in Chemical Industry.
W79-01703 5D

Trickle Emitter for Subterranean Irrigation,
W79-01860 3F

Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

Hot Water Reservoir,
W79-01862 8C

Municipal Water Supply System,
W79-01863 3A

Adsorbent Process for Oily Materials,
W79-01864 5G

Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

Flow Control Device for an Irrigation Ditch,
W79-01868 3F

Collapsible and Expansible Barrage,
W79-01869 8A

Manoeuverable Weir,
W79-01870 8G

Method and Means of Treating Water Wells,
W79-01871 3B

Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

Method of Separation of Fluoride Ion From Water,
W79-01873 5F

Process for the Purification of Industrial Effluents,
W79-01874 5D

Method for Treating Aqueous Wastes Containing at Least 1% Proteinaceous Matter,
W79-01875 5D

Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

Device for Treating Waste Water,
W79-01877 5D

Water Softening System,
W79-01878 5F

Apparatus for Purifying Waste Waters,
W79-01880 5D

Sludge Settling and De-Watering Apparatus,
W79-01881 5D

Regulated Flow-Reducing Device Particularly Useful for Drip Irrigation,
W79-01882 3F

Solar Photolysis of Water,
W79-01883 2K

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

Method and Apparatus for Purification of Water,
W79-01886 5D

Treatment of Aqueous Systems,
W79-01887 8G

Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

Oil Spill Retrieval System,
W79-01889 5G

Liquid Waste Processing System,
W79-01890 5D

PATH OF POLLUTANTS
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

PATTERNS RECOGNITION
Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

PEACOCK SPRINGS (FLA)
Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

PEAK DISCHARGE
Flood Hazard Information: Clover Creek, Stillwater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
W79-01851 4A

Flood Plain Information: Salt Creek and Tributaries, Olney, Texas.
W79-01852 4A

Flood Plain Information: Muddy Branch, Montgomery County Maryland.
W79-01854 4A

Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

Flood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857 4A

Flood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

PEATS
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation
W79-01702 3

PENETRATION
A Method of Promoting Penetration of Water into Tight, Sloping Soil Under Drip Irrigation
W79-01719 3

PENNSYLVANIA
Flood Plain Information: Pigeon Creek, Bentleyville, Fallowfield Township and Somerset Township, Pennsylvania.
W79-01850 4A

Flood Plain Information: Frankstown Branch Juniata River, Claysburg, Pennsylvania.
W79-01853 4A

Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5

PERMEABILITY
Dolomitization in the Floridan Aquifer,
W79-01749 2

PERMIAN (TEXAS)
Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2

PESTICIDE RESIDUES
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5

PESTICIDES
Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides
W79-01709 5

State of the Art Report on Pesticide Disposal Research,
W79-01764 5

PETROGRAPHY
Dolomitization in the Floridan Aquifer,
W79-01749 2

PETROLEUM DEVELOPMENT
A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5

PETROLEUM HYDROCARBONS
The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5

Environmental Assessment of Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol 1, Biological Studies.
W79-01811 5

HALLUSIA
Filter-Feeding Ethology of Benthic Invertebrates (Ascidians). V. Influence of Temperature on Pumping, Filtration, and Digestion Rates and Rhythms in Phallusia Mamillata,
W79-01653 5C

HENOLS
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

HENYLALAMINE
Interaction of Chlorine and Organic Molecules--Effects of Inorganics,
W79-01903 5B

IOSPHATES
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

IOSPHORUS
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

Relationship Between Soil Test and Small Grain Response to P Fertilization in Field Experiments,
W79-01786 3F

An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

Factors Affecting Sediment Phosphorus Release in Lake Carl Blackwell, Oklahoma,
W79-01984 5C

The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

OTO-OXIDATION REACTION
Solar Photolysis of Water,
W79-01883 2K

OTOPERIODISM
Some Effects of Photoperiod, Temperature, and Food on Emergence in Three Species of Chironomidae (Diptera),
W79-01688 5C

PHREATOPHYTES
Reducing Phreatophyte Transpiration,
W79-01562 3B

PHYSICAL PROPERTIES
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

PHYSIOLOGY
Physiological and Behavioral Effects,
W79-01794 5C

PHYTOPLANKTON
Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5C

Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

PICTORIAL INFORMATION PROCESSOR
Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

PIEZOMETERS
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

PIGEON CREEK (PA)
Flood Plain Information: Pigeon Creek, Bentleyville, Fallowfield Township and Somerset Township, Pennsylvania.
W79-01850 4A

PLANKTON
Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

PLANNING
United States Participation in the International Hydrological Program 1975-.
W79-01509 2A

Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

Wabash River Basin Comprehensive Study. Vol I. Main Report,
W79-01830 6B

Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

A Land Study for Downtown Lake Charles,
W79-01838 6B

Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

Innovative Management Concept for 208 Planning,
W79-01848 5G

Karstic Institutional Conflicts and Opportunities,
W79-01935 6E

The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

PLANT BREEDING
Testing Salt Tolerance Variability Among Tall Wheatgrass Lines,
W79-01879 3C

PLANT GROWTH
Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

PLANT MORPHOLOGY
Morphological Variation of Elodea in Western Massachusetts: Field and Laboratory Studies,
W79-01743 5C

PLANT POPULATIONS
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

Preliminary Guide to Wetlands of the West Coast States; Major Associations and Communities Identified.
W79-01665 2I

PLANTING MANAGEMENT
Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

PLASTIC PIPES
Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

PLATTE RIVER BASIN (NEB)
Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

POCAHONTAS COUNTY (WVA)
Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

POLAROGRAPHIC ANALYSIS
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

POLITICAL ASPECTS
Management of Local Water Systems in Alabama,
W79-01536 6E

POLLUTANT IDENTIFICATION
Measurement of Total Organic Concentration in Water,
W79-01600 5A

Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

POLLUTANTS
Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

POLLUTION ABATEMENT
The Outlook for Progress and Technological Methods in a Paper Industry Confronted with Environmental Problems,
W79-01623 5D

POLLUTION (WATER)
Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

POLYCHLORINATED BIPHENYLS
Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

POLYMERS
Removal of Components from Wastewaters Generated in Textile Finishing Processes. Part II. Separation of Contents from Wastewaters. Size (Eliminierungen von Inhaltsstoffen in Abwassern der Textilveredlung-Teil II Trennung con Abwasser-Inhaltsstoffen, Schlichte,
W79-01757 5D

PONDWEEDS
Distribution and Production of Sago Pondweed (Potamogeton Pectinatus L.) on a Northern Prairie Marsh,
W79-01629 2I

POPULATION GROWTH
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

POROSITY
Dolomitization in the Floridan Aquifer,
W79-01749 2F

POROUS MEDIA
Two-Dimensional Unsteady Water Flow in Unsaturated Porous Media,
W79-01556 2G

A Finite Element Weighted Residual Solution to One-Dimensional Field Problems,
W79-01558 2G

Finite Element Solution of Two-Dimensional Unsteady and Unsaturated Flow in Porous Media.
W79-01560 2G

POTABLE WATER
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

Municipal Water Supply System,
W79-01863 3A

POTAMOGETON SPECIES
Distribution and Production of Sago Pondweed (Potamogeton Pectinatus L.) on a Northern Prairie Marsh,
W79-01629 2I

POTASSIUM
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

POTASSIUM CHLORIDE
Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

POTATOES
Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

POULTRY
NBC Requests Exemption from Runoff Rules.
W79-01649 5G

POWDER RIVER BASIN (WYO)
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

POWERPLANTS
Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants,
W79-01674 5C

Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

PRECIPITATION (ATMOSPHERIC)
Ralston Creek Hourly Precipitation Model,
W79-01727 2B

PRECIPITATION MODELS
Ralston Creek Hourly Precipitation Model,
W79-01727 2B

PREDATION
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

PRESSURE TRANSDUCERS
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

PRICING
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

PRIMARY PRODUCTIVITY
Wetland Plant Communities Along the Easte Shoreline of Lake Ontario,
W79-01644

PROBABILITY MODEL
A Probability Model for Matching Suspec with Spills - or Did the Real Spiller Get Awa
W79-01748 5

PRODUCTIVITY
Improvement and Evaluation of Techniques f the Mechanical Removal and Utilization Excess Aquatic Vegetation,
W79-01584 4

Environmental Planning for an Alaskan Wat Oriented Recreational Area,
W79-01900 5

PROGRAMS
United States Participation in the Internatio Hydrological Program 1975-.
W79-01509 2

PROGRESS REPORT
Montana's Water Resources: A Research Tru
W79-01541

PROJECTIONS
Water Requirements and Desalting in the Unit States of America,
W79-01582 3

PROTEINS
Method for Treating Aqueous Wastes Conta ing at Least 1% Proteinaceous Matter,
W79-01875 5

Measurements of Phytoplankton-Protein Co tent with the Heated Biuret-Folin Assay,
W79-01995

PROVO RIVER (UT)
Flood Plain Information: Provo River and Sl Canyon Creek, Provo, Utah.
W79-01857

PUBLIC HEALTH
Viruses in Finished Water: The Occoquan Ex rience,
W79-01577

Public Hearing on the Draft Environmen Impact Statement Relating to Palm Be County Sewage Treatment Improvement P gram.
W79-01839

Alpha Radiation Monitoring of National P Service Administered Caves in United Sta
W79-01943

PUBLIC PARTICIPATION
Public Hearing on the Draft Environmen Impact Statement Relating to Palm Be County Sewage Treatment Improvement P gram.
W79-01840

Illinois Coastal Zone Management Program, Year Work Product, Vol. VI. Public Partici tion Activities by League of Women Vot Northeastern Illinois Pln. Commission, L Michigan Federation.
W79-01845

PUERTO RICO
Hydrogeology of a Cave Utilized for Put Water Supply: Rio Camuy Cave, Puerto Ri U.S.A.,
W79-01957

PULP AND PAPER INDUSTRY
Technical-Economical Solution to the Probl of Effluents in an Integrated Paper Mill (Se cion tecnico-economica del problema

efluente en una plant papelera integrada en oper-acion),
W79-01593 5D

Adventures in Designing for 1984 Effluent Re-duction,
W79-01608 5G

Components of a Successful In-Mill Close Up Program,
W79-01613 5D

Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

Austrian National Report on Non-Waste Tech-nology,
W79-01621 3E

The Outlook for Progress and Technological Methods in a Paper Industry Confronted with Environmental Problems,
W79-01623 5D

Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

Two Examples of Low Emission Technologies in the Pulp and Paper Industry,
W79-01627 5D

The Production of Pulp from Marsh Grass.
W79-01630 4A

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Re-covery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

Toxicity Removed by Foam Separation,
W79-01770 5D

Status of the Closed-Cycle Concept Kraft Mill of Great Lakes Paper Co.,
W79-01773 3E

LP WASTE

Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide),
W79-01596 5D

LP WASTES

Disk Filters for Effluent Purification (Diskovye fil'try dlya ochistki stochnykh vod),
W79-01594 5D

Potential for an Improved Return on Investment in the Production of Wood Fiberboard Using the Wet Process (Moznosti zvysenia efektivnosti vyroby drevovlaknitych dosak mokrym sposo-bom),
W79-01595 5D

Characterization of Various Condensate Streams in the Kraft Process,
W79-01601 5D

Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zan-ieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

Submersible Pumps are Proven in Effluent System at Newton Falls (New York),
W79-01603 5D

'Photolysis' -- Process for Effluent Contami-nants,
W79-01604 5D

Use in the Brick Industry of Highly Discolored Fibers Recovered from the Final Effluent Clari-fier of a Paper Mill (Verwertung von stark ver-faerbtem Fangstoff aus der Rest-abwasserklaer-anlage einer Papierfabrik in der Ziegelindustrie),
W79-01607 3E

Impact of Residual Biosolids on Receiving Water Quality,
W79-01609 5C

Studies of Membrane Processes for Pulp Mill Pollution Control,
W79-01611 5D

Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612 5D

Spill Containment and Effluent Management Program at the Hopewell Mill, Continental Forest Industries, The Continental Group, Inc.,
W79-01614 5D

Operating Experiences at Longview Fibre Com-pany's Pure Oxygen Activated Sludge System,
W79-01615 5D

Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

The Relationship of Biological Population to Activated Sludge Plant Performance,
W79-01619 5D

How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

Reduction of the Water-Polluting Discharges from a Bleached Sulfate Pulp Mill (Reduction de la charge de pollution de l'eau provenant d'une usine de pate au sulfate blanchie),
W79-01625 5D

Biological Method for Purifying Kraft Pulp Mill Condensates,
W79-01626 5D

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Re-covery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

Removal of Color from Carbonate Pulping Ef-fluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

Toxicity Removed by Foam Separation,
W79-01770 5D

Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspend-ed Solids,
W79-01771 5A

Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01774 5C

PULSE ANODIC STRIPPING

Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulo-metric Techniques to the Determination of Ura-nium,
W79-01517 5A

PULSE POLAROGRAPHY

Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulo-metric Techniques to the Determination of Ura-nium,
W79-01517 5A

PUMPING

How They're Harnessing the Sun to Pump Water,
W79-01679 3F

PUMPING PLANTS

Indian Creek Pumping Station, Mankato, Minne-sota; Hydraulic Model Investigation,
W79-01663 8C

World's Largest Solar-Powered Irrigation System Operating in Arizona: Rising Energy Costs Cause Exploratory Venture.
W79-01692 3I

PUMPS

Submersible Pumps are Proven in Effluent System at Newton Falls (New York),
W79-01603 5D

RACINE COUNTY (WIS)

Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Ap-pendix II,
W79-01530 4

RADIATION

Alpha Radiation Monitoring of National Park Service Administered Caves in United States,
W79-01943

Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990

RADIOACTIVE TECHNIQUES

A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Re-verse-Osmosis Water Purification Systems,
W79-01576

RADIOACTIVE WASTES

A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Re-verse-Osmosis Water Purification Systems,
W79-01576 5

Liquid Waste Processing System,
W79-01890 5

RADIOISOTOPES

A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Re-verse-Osmosis Water Purification Systems,
W79-01576 5D

RAINFALL

Ralston Creek Hourly Precipitation Model,
W79-01727 2B

REACTION

Trickle-Bed Reactor Performance, Part II: Re-action Studies,
W79-01566 5D

RECLAMATION

Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

RECREATION
Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

An Unobtrusive Measure of the Recreational Value of a Lake,
W79-01986 6B

RECREATION DEMAND
Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

RECREATION FACILITIES
Water Resources Appraisal for Hydroelectric Licensing, Kern River Basin, California.
W79-01835 8C

RECREATION STANDARDS
Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

RECYCLING
Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

Examination of the Problem of Recuperative Treatment of Waste Water in the Chemical Industry (Consideratii Asupra Problemei Epurari Recuperative A Apelor Reziduale),
W79-01579 5D

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

Rationalization and Environmental Problems of Beamhouse Operations,
W79-01778 5D

REDUCTION (CHEMICAL)
Predicting the Anaerobic Degradation of Organic Chemical Pollutants in Waste Water Treatment Plants from Their ELectrochemical Reduction Behavior,
W79-01539 5B

REFUSE
Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

REGIONAL DEVELOPMENT
The Upper Columbia Navigation Proposal.
W79-01843 4A

Karstic Institutional Conflicts and Opportunities,
W79-01935 6E

A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2F

REGIONAL IMPACT ASSESSMENT
Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

REGIONAL WATER RESOURCE PLANNING
Innovative Management Concept for 208 Planning,
W79-01848 5G

REGRESSION ANALYSIS
A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

REGULATION
Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

NBC Requests Exemption from Runoff Rules.
W79-01649 5G

On Optimal Regulation Policies for Certain Multi-Reservoir Systems,
W79-01731 4A

REMOTE SENSING
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes,
W79-01637 7B

Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee,
W79-01638 7B

The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

Remote Sensing of Wetlands,
W79-01642 7B

Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

REPRODUCTION
Influence of Petroleum on Egg Formation and Embryonic Development in Seabirds,
W79-01802 5C

RESEARCH FACILITIES
The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

RESERVOIR CONSTRUCTION
Hot Water Reservoir,
W79-01862 8C

RESERVOIR OPERATION
Information for Reservoir Control in the Northumbrian Water Authority,
W79-01502 4A

RESERVOIRS
On Optimal Regulation Policies for Cert
Multi-Reservoir Systems,
W79-01731

Interim Report No. 2, Wabash River Ba
Comprehensive Study Covering Reservoir Si
on Embarrass River, IL, and Clifty Creek a
Patoka River, in, Vol. I: Report.
W79-01827

RESINS
Use of Continuous Ion Exchange for Remo
of Environmental Contaminants from Wa
Streams,
W79-01768

RESOURCE AVAILABILITY
Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unir
Pass 1948 - 1976. A Historical Review. Volu
1,
W79-01819

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unir
Pass 1948 - 1976. A Historical Review. Volu
2,
W79-01820

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unir
Pass 1948 - 1976. A Historical Review. Volu
3,
W79-01821

RESOURCES DEVELOPMENT
Texas Coastal Management Program Ecolog
Systems Component, User's Manual.
W79-01787

Environmental Assessment of Alaskan Conti
tal Shelf. Final Reports of Principal Invest
tors, Vol 1, Biological Studies.
W79-01811

Environmental Assessment of the Alaskan C
tinental Shelf Final Reports of Principal Inv
gators, Vol 2. Biological Studies.
W79-01818

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Uni
Pass 1948 - 1976. A Historical Review. Vol
1,
W79-01819

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Uni
Pass 1948 - 1976. A Historical Review. Vol
2,
W79-01820

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Uni
Pass 1948 - 1976. A Historical Review. Vol
3,
W79-01821

RETAINING WALLS
A Study of Articulated Concrete Revet
Mattress: Test and Analysis--Results of FY
Program,
W79-01513

RETURN FLOWS
Arsenic Pollution from Underdrainage
Runoff from Golf Greens,
W79-01752

REVERSE OSMOSIS
Parametric Study and Preliminary Evaluati
Reverse Osmosis for Seawater Desalination,
W79-01580

Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

Removal of Components from Wastewaters Generated in Textile Finishing Processes. Part II. Separation of Contents from Wastewaters. Size (Eliminierungen von Inhaltsstoffen in Abwassern der Textilveredlung-Teil II Trennung con Abwasser-Inhaltsstoffen, Schlichte,
W79-01757 5D

Liquid Waste Processing System,
W79-01890 5D

EVIEWS
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information,
W79-01978 5D

CE
Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

PARIAN LAND
A Nondestructive Approach to Reducing Riparian Transpiration,
W79-01586 3B

PARIAN PLANTS
A Nondestructive Approach to Reducing Riparian Transpiration,
W79-01586 3B

Genetic Damage to a Fern Population Growing n a Polluted Environment: Segregation and Description of Gametophyte Mutants,
V79-01745 5C

PARIAN WATER LOSS
Reducing Phreatophyte Transpiration,
V79-01562 3B

VER BASIN DEVELOPMENT
nterim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites n Embarrass River, IL, and Clifty Creek and atoka River, in, Vol. I: Report.
V79-01827 6B

VER EXE (ENGLAND)
he 1976 Drought and Nitrate Levels in the iver Exe Basin,
/79-01504 5B

CK PROPERTIES
onstruction Methods which Recognize the Mechanics of Sinkhole Development,
/79-01974 8G

OT
onionic Surfactant Effects on Growth and Posity of Barley Roots,
/79-01564 2I

OT DISTRIBUTION
oot-Sink Descriptions of Water Supply to Dryd Wheat,
79-01732 3F

OT SYSTEMS
fferences Among Genotypes of Corn in the netics of P Uptake,
79-01733 3F

Profile Modification of a Fragiudalf to Increase Crop Production,
W79-01740 3F

Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

ROOTED AQUATIC PLANTS
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

The Production of Pulp from Marsh Grass.
W79-01630 4A

The Salt Marsh Flora of Mississippi,
W79-01632 2I

ROUGHNESS (HYDRAULIC)
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

RUNOFF
Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

SACRAMENTO VALLEY (CALIF)
Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

SAINT LOUIS COUNTY (MINN)
Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

SALINE SOILS
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

SALINE WATER-FRESHWATER INTERFACES
Applications of Mixing Experiments to Estuaries,
W79-01911 2L

SALINITY
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival,
W79-01682 5C

Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

SALINITY CONTROL
Investment Planning for Colorado River Salinity Control,
W79-01587 5G

SALMON
Determination and Description of Knowledge of the Distribution, Abundance, and Timing of Salmonids in the Gulf of Alaska and Bering Sea. A Supplement,
W79-01815 5C

SALT CREEK (TX)
Flood Plain Information: Salt Creek and Tributaries, Olney, Texas.
W79-01852 4A

SALT MARSHES
The Salt Marsh Flora of Mississippi,
W79-01632 2I

Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01750 5C

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

SALT TOLERANCE
Testing Salt Tolerance Variability Among Tall Wheatgrass Lines,
W79-01879 3C

Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

SALTHOLM (DENMARK)
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

SALTS
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

SAMPLING
Possible Changes in Aerosol Composition Due to Departure from Equilibrium Conditions During Sampling,
W79-01554 5A

Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

How to Conduct a Wastewater Survey: Part II - Developing Waste Stream Profiles,
W79-01760 5G

SAN PABLO BAY (CALIF)
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

SATELLITE (ARTIFICIAL)
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

SAUDI ARABIA
On the Management of Karst Aquifers in Saudi Arabia,
W79-01962 2F

SCHOOLCRAFT COUNTY (MICH)
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

SCULPINS
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

SEASONAL
Seasonal Dynamics of Cu2+, Zn2+, Ca2+, and Mg2+ in Gonads and Liver of Winter Flounder (Pseudopleuronectes Americanus): Evidence for Summer Storage of Zn for Winter Gonad Development in Females,
W79-01677 5C

The Effect of Temperature and Body Size on Electron Transport System Activity in Freshwater Zooplankton,
W79-01683 5C

Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

SEASONAL PERSISTENCE
Analysis of Seasonal Persistence of Climate in Nebraska,
W79-01538 2B

SEDIMENT
Microstructure of Agglomerated Suspended Sediments in Northern Chesapeake Bay Estuary,
W79-01923 2L

SEDIMENT CONTROL
Sediment Control Conference, Held at Helena Montana on December 15, 1972.
W79-01523 4D

SEDIMENT ORIGIN
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

SEDIMENT SEALING
Reclamation of Polluted Farm Ponds,
W79-01988 5G

SEDIMENTATION
Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

SEDIMENTATION RATES
Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

SEDIMENTS
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

SEEDS
Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

SEISMIC STUDIES
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2F

SELENIUM
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

SELF-PURIFICATION
Mathematical Models of Dissolved Oxygen Concentration in Fresh Water,
W79-01998 5C

SEMIARID CLIMATES
Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

SEPARATION TECHNIQUES
Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

Method of Separation of Fluoride Ion From Water,
W79-01873 5F

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

SEWAGE
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W79-01643 5C

SEWAGE DISPOSAL
Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

SEWAGE SLUDGE
Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547 5E

SEWAGE TREATMENT
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

Apparatus for Purifying Waste Waters,
W79-01880 5D

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

SHALLOW WATER
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

SHINERS
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

SHORE BIRDS
Use of Dredged Material Islands by Colonial Seabirds and Wading Birds in New Jersey,
W79-01658 5

SHORES
Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2

SHRIMP
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5

SHRUBS
Fluvial Adjustments to the Spread of Tamarisk in the Colorado Plateau Region,
W79-01919

SIMAZINE
Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5

SIMULATION ANALYSIS
Simulation of Nitrogen Processes in Soils for Estimating Fertilizer Requirements,
W79-01713 2

SINKS
Construction Methods which Recognize the Mechanics of Sinkhole Development,
W79-01974 8

Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5

SIPHONS
Air-Regulated Siphon Spillways at Spelga Dam
W79-01925

SLATE CANYON CREEK (UT)
Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857

SLOPES
Hydrologic Interpretation of Basin Morphology
W79-01899

SLUDGE
Submersible Pumps are Proven in Effluent System at Newton Falls (New York),
W79-01603

Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612

SLUDGE DEGRADATION
Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547

LUDGE DISPOSAL
Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

Leather Tanning Industry-Sludge Problems Ahead,
W79-01779 5E

UDGE TREATMENT
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschaemmen),
V79-01606 5E

IALL WATERSHEDS
The Hydrology of Karst Urban Areas,
V79-01948 2A

ELTS
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
V79-01753 5C

AILS
eeding and Growth Rates of Polinices Duplicaus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
/79-01669 5C

emperature Adaptation in the Freshwater nail, Helisoma Trivolvis (Say),, in an Artificial- Heated Reservoir in the Southeastern United tates,
/79-01681 5C

OW COVER
ariations in the Duration of Stable Snow over in the USSR,
/79-01506 2C

OW SURVEYS
nowpack Ground Truth: Radar Test Site, eamboat Springs, Colorado, April 8-16, 1976,
/79-01527 2C

OWPACKS
nowpack Ground Truth: Radar Test Site, eamboat Springs, Colorado, April 8-16, 1976,
79-01527 2C

IAL IMPACT
nergy Resources Development in Wyoming's owder River Basin: An Assessment of Potential cial and Economic Impacts,
79-01545 6B

nvironmental Assessment of Water Quality anagement Plans.
79-01844 5G

IAL PARTICIPATION
Unobtrusive Measure of the Recreational lue of a Lake,
79-01986 6B

IAL VALUE
Unobtrusive Measure of the Recreational lue of a Lake,
79-01986 6B

ALGAE
stribution of Bluegreen Algae in a Mississippi lf Coast Salt Marsh,
9-01750 5C

SOIL AMENDMENTS
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

SOIL EVAPORTION
Analysis of Fallow-Farming Systems in Semi-Arid Africa Using a Model to Simulate the Hydrologic Budget,
W79-01785 2D

SOIL MANAGEMENT
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

SOIL MATRIX POTENTIAL
Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

SOIL MOISTURE
Analysis of Fallow-Farming Systems in Semi-Arid Africa Using a Model to Simulate the Hydrologic Budget,
W79-01785 2D

SOIL POLLUTION
Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

SOIL PROPERTIES
Crop Water Requirement in Relation to Climate and Soil,
W79-01712 2G

SOIL TESTS
Relationship Between Soil Test and Small Grain Response to P Fertilization in Field Experiments,
W79-01786 3F

SOIL TYPES
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

SOIL WATER
The Use of Nonionic Surfactants on Soils,
W79-01571 2G

Profile Modification of a Fragiudalf to Increase Crop Production,
W79-01740 3F

SOIL WATER MOVEMENT
Linearized Moisture Flow with Loss at the Soil Surface,
W79-01704 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law,
W79-01725 2G

Root-Sink Descriptions of Water Supply to Dryland Wheat,
W79-01732 3F

Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

SOIL WATER POTENTIAL
Root-Sink Descriptions of Water Supply to Dryland Wheat,
W79-01732 3F

SOLAR RADIATION
Solar Radiation and Urban Heat Islands,
W79-01568 2B

World's Largest Solar-Powered Irrigation System Operating in Arizona: Rising Energy Costs Cause Exploratory Venture.
W79-01692 3F

SOLUTES
Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

SOUTH CAROLINA
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

Temperature Adaptation in the Freshwater Snail, Helisoma Trivolvis (Say),, in an Artificially Heated Reservoir in the Southeastern United States,
W79-01681 5C

SOUTH DAKOTA
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

Feedlot Pollution: A Solvable Problem.
W79-01671 5B

Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

SOUTHWEST U.S.
Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

SOYBEAN
Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

SOYBEANS
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

SPARSE DATA
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

SPATIAL DISTRIBUTION
Variations in the Duration of Stable Snow Cover in the USSR,
W79-01506 2C

SPECTROPHOTOMETRY
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

SPECTROSCOPY
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

SPELGA DAM (IRELAND)
Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

SPILLWAYS
Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

SPOIL BANKS
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

SPRAY IRRIGATION
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

SPRINGS
Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

SPRINKLER IRRIGATION
Sprinkler Irrigation Practices and Water Losses: Water Shortages Underline Need for Conservation,
W79-01673 3F

Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

STAGE-DISCHARGE RELATIONS
Flood Plain Information: Pigeon Creek, Bentleyville, Fallowfield Township and Somerset Township, Pennsylvania.
W79-01850 4A

Flood Plain Information: Frankstown Branch, Juniata River, Claysburg, Pennsylvania.
W79-01853 4A

Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

STANDING CROPS
Distribution and Production of Sago Pondweed (Potamogeton Pectinatus L.) on a Northern Prairie Marsh,
W79-01629 2I

STATE WATER AGENCIES (ALABAMA)
Management of Local Water Systems in Alabama,
W79-01536 6E

STATISTICAL MECHANICS
The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

STATISTICAL METHODS
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

STATISTICAL MODELS
The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law,
W79-01725 2G

A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

STILLWATER CREEK (CA)
Flood Hazard Information: Clover Creek, Stillwater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
W79-01851 4A

STOCHASTIC PROCESSES
A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

STOMATA
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

STORAGE
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

STORAGE THEORY
Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

STRATIFIED FLOW
Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

STREAM HABITAT IMPROVEMENT
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

STREAM IMPROVEMENT STRUCTURES
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

STREAM POLLUTION
Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

STREAM SURVEILLANCE
The West Branch Shabakunk Creek: A Surveillance Report of Physical Conditions and Biological Health,
W79-01543 5C

Harry's Brook - A Surveillance Report of Phy
cal Conditions and Biological Health,
W79-01907

STREAMS
Studies on the Decomposition of Allochthonc
Detritus in Two Southern California Strear
W79-01588

STREPTOCOCCUS
Use of Fecal Streptococci as Indicators of Pol
tion in Soil,
W79-01738

STREPTOCOCCUS SP
Streptococcus Sp. from Marine Fishes Alc
the Alabama and Northwest Florida Coast
the Gulf of Mexico,
W79-01698

STRESS
Biological Assessment of Water Quality i
Large River System: An Evaluation of
Method for Fishes,
W79-01553

STRIP MINE WASTES
Decision Making in a Multiple-Use Approach
the Reclamation of Strip-Mined Lands,
W79-01730

STRIPMINES
Hydrologic Characteristics of Coal-Mine Spc
Southeastern Montana,
W79-01542

STRUCTURES
Collapsible and Expansible Barrage,
W79-01869

Manoeuverable Weir,
W79-01870

Wave Forces on Causeway-Type Cos
Bridges,
W79-01983

SUBARCTIC
Hydrologic Interpretation of Basin Morphol
W79-01899

SUBMERGED PLANTS
Submerged Vegetation of the Rotorua and
kato Lakes 3. Lake Rerewhakaiitu,
W79-01652

SUBSURFACE DRAINAGE
The Timeliness Benefit of Subsurface Drain
W79-01728

SUBSURFACE INVESTIGATIONS
A Preliminary Investigation on Seismic T
niques Used to Locate Cavities in Karst
rains,
W79-01940

SUBSURFACE IRRIGATION
Effect of Soil Mixtures and Irrigation Met
on Leaching of N in Golf Greens,
W79-01777

Trickle Emitter for Subterranean Irrigation,
W79-01860

SUCCESSION
A Comparison of Plant Succession and
Utilization on Diked and Undiked Dredged
terial Islands in North Carolina Estuaries,
W79-01659

SUCK BEND (CHATTAHOOCHEE RIVER)
Navigation Conditions, Suck Bend Reach,
tahoochee River, Alabama and Georgia;
draulic Model Investigation,
W79-01664

NFLOWERS
unflower Yield and Water Use as Influenced by anting Date, Population, and Row Spacing, 79-01999 3F

PPLEMENTAL IRRIGATION
rigation Effects on Vegetative and Reproduc-ve Development of Three Soybean Cultivars, 79-01708 3F

FACE WATERS
oblems in Automating the Monitoring of Sur-ce Water Chemistry, 79-01507 5A

FACTANTS
onionic Surfactant Effects on Growth and Po-ity of Barley Roots, 79-01564 2I

e Use of Nonionic Surfactants on Soils, 79-01571 2G

moval of Components from Wastewaters nerated in Textile Finishing Processes. Part Separation of Contents from Wastewaters. e (Eliminierungen von Inhaltsstoffen in Ab-ssern der Textilveredlung-Teil II Trennung Abwasser-Inhaltsstoffen, Schlichte, 79-01757 5D

FACTANTS (NONIONIC)
take and Translocation of a Nonionic Surfac-t by Barley, 79-01563 2I

VEY
serving the Heritage of Gasparilla Island, an proach to Conservation of the Economic, tural, Historical, and Natural Resources of Island, 9-01646 6G

merged Vegetation of the Rotorua and Wai-o Lakes 3. Lake Rerewhakaiitu, 9-01652 2H

VEY DATA
ort on the Quality of the Water of the James er, South Dakota, 1970. 9-01837 5G

VEYS
lication in the Water Industry of Regional chemical Maps of England and Wales, 9-01501 5B

icle Washing Operations and Wastewater charges, Fort Drum, NY -- Findings and ommendations, 9-01573 5D

v to Conduct a Wastewater Survey: Part II - veloping Waste Stream Profiles, 9-01760 5G

onnaissance of the Intertidal and Shallow tidal Biotic Lower Cook Inlet, 9-01824 5C

orne Multispectral Mapping of the Inter-Zone of Southern Alaska, 9-01825 5C

er Well Productivity Related to Photo-Lin-ents in Carbonates of Frederick Valley, yland, -01954 2F

ENDED LOAD
cts of Turbidity and Suspended Material in atic Environments, Literature Review, -01656 5C

ostructure of Agglomerated Suspended ments in Northern Chesapeake Bay Estuary, -01923 2L

SUSPENDED SOLIDS
Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism, W79-01617 5C

Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review, W79-01656 5C

TAMARISK
Fluvial Adjustments to the Spread of Tamarisk in the Colorado Plateau Region, W79-01919 2J

TANK TRUCKS
Clean Up Mixed Waste Streams -- The Tank Truck Washing Example. W79-01583 5D

TANNERY WASTES
Rationalization and Environmental Problems of Beamhouse Operations, W79-01778 5D

Leather Tanning Industry-Sludge Problems Ahead, W79-01779 5E

The Evolution of Tannery Effluent Treatment--Guidelines for Further Investigations, W79-01780 5D

TASTE
Consumer Attitudes Toward Taste and Odor in Water, W79-01739 6B

TECHNICAL FEASIBILITY
The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee, W79-01639 7B

TECHNOLOGY
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations, W79-01573 5D

Clean Up Mixed Waste Streams -- The Tank Truck Washing Example. W79-01583 5D

The Outlook for Progress and Technological Methods in a Paper Industry Confronted with Environmental Problems, W79-01623 5D

TECHNOLOGY TRANSFER
Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information, W79-01978 5D

TELEOSTS
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects, W79-01667 5C

TEMPERATURE
Combined Temperature-Salinity Effects on Grass Shrimp, W79-01645 5C

Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects, W79-01667 5C

Temperature Requirements of Tilapia Zillii, W79-01668 5C

Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form, W79-01670 5C

Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival, W79-01682 5C

The Effect of Temperature and Body Size on Electron Transport System Activity in Freshwater Zooplankton, W79-01683 5C

The Influence of Constant and Cyclic Acclimation Temperatures on the Metabolic Rates of Panopeus Herbstii and Uca Pugilator, W79-01685 5C

Some Effects of Photoperiod, Temperature, and Food on Emergence in Three Species of Chironomidae (Diptera), W79-01688 5C

Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard), W79-01700 5C

Seedling Emergence as Related to Temperature and Moisture Tension, W79-01751 4D

Temperature Dependence of Water Uptake by Plant Roots, W79-01910 2I

TENNESSEE
Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee, W79-01638 7B

The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee, W79-01639 7B

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure, W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies, W79-01947 2A

TERRY COUNTY (TEXAS)
Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields, W79-01927 7C

TERTIARY TREATMENT
Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information, W79-01978 5D

TEXAS
Texas Coastal Management Program Ecological Systems Component, User's Manual. W79-01787 5C

Flood Plain Information: Salt Creek and Tributaries, Olney, Texas. W79-01852 4A

Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas. W79-01859 4A

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas, W79-01894 3F

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated

TEXAS

Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2F

TEXAS HIGH PLAINS

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

TEXAS TRANS PECOS

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

TEXTILES

Removal of Components from Wastewaters Generated in Textile Finishing Processes. Part II. Separation of Contents from Wastewaters. Size (Eliminierungen von Inhaltsstoffen in Abwassern der Textilveredlung-Teil II Trennung con Abwasser-Inhaltsstoffen, Schlichte,
W79-01757 5D

Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

THAMES WATER AUTHORITY

Innovative Management Concept for 208 Planning,
W79-01848 5G

THEORETICAL ANALYSIS

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law,
W79-01725 2G

THERMAL LOADING

Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

THERMAL POLLUTION

'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

Temperature Requirements of Tilapia Zillii,
W79-01668 5C

Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

Temperature Adaptation in the Freshwater Snail, Helisoma Trivolvis (Say),, in an Artificially Heated Reservoir in the Southeastern United States,
W79-01681 5C

The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

Vertebral Variation in Zebrafish (Brachydanio Rerio) Related to the Prefertilization Temperature History of Their Parents,
W79-01687 5C

Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard),
W79-01700 5C

Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

THERMAL POWER

Geothermal Power and Water Production Studies at the University of California,
W79-01546 3E

Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

THERMAL POWER PLANTS

Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

THERMAL POWERPLANTS

Geothermal Power and Water Production Studies at the University of California,
W79-01546 3E

THERMAL SCANNERS

Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

THERMAL STRESS

The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

THERMAL WATER

Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

THREATENED SPECIES

Environmental Status of the Lake Mich
Region, Volume 11. Natural Areas of the L
Michigan Drainage Basin and Endangered
Threatened Plant and Animal Species,
W79-01555

TIDAL HYDRODYNAMICS

Numerical Simulation of Tidal Hydrodynar
Great Egg Harbor and Corson Inlets,
Jersey,
W79-01661

TIDES

Hydraulics and Stability of Tidal Inlets,
W79-01519

TILAPIA ZILLII

Temperature Requirements of Tilapia Zillii,
W79-01668

TIME SERIES ANALYSIS

A Manual for Hydrologic Time Series D
sonalization and Serial Dependence Reduc
W79-01989

TISSUE ANALYSIS

Metal Concentrations (AS, CD, CU, PB
ZN) in Shorthorn Sculpins, Myoxocep
Scorpius (Linnaeus) and Arctic Char, Salve
Alpinus (Linnaeus), From the Vicinity of St
cona Sound, Northwest Territories,
W79-01552

Scientific and Technical Assessment Repo
Cadmium,
W79-01756

TOBACCO

Irrigation Timing-Its Influence on the Effe
Salinity and Waterlogging Stresses in Tol
Plants,
W79-01720

Effect of Slow Release Fertilizer on Fer
Residues and on Yield and Composition of
Cured Tobacco,
W79-01736

Nitrogen Release Characteristics of Isob
dene Diurea and its Effectiveness as a Sou
N for Flue-Cured Tobacco,
W79-01841

TOMATOES

Water Supplies and Costs in Relation to
Resource Decisions and Profits on Sacra
Valley Farms,
W79-01737

TOPOGRAPHY

Karst Topography and Its Occurrence in
tucky,
W79-01937

TOWANDA LAKE (KAN)

Preliminary Evaluation of the Water Qua
Proposed Towanda Lake, Kansas.
W79-01666

TOXICITY

Toxicity of Intermittent Chlorination to
water Fish: Influence of Temperature and
rine Form,
W79-01670

Scientific and Technical Assessment Rep
Cadmium,
W79-01756

Acute and Chronic Toxicity, Uptake and
ation, and Sublethal Response of Alaska
Organisms to Petroleum Hydrocarbons,
W79-01790

Sublethal Effects of Petroleum Hydroc
and Trace Metals Including Biotransform

as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

Biological Fate of Metals in Fish,
W79-01792 5C

Morphology,
W79-01795 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

RACE ELEMENTS
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

RACE METALS
Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

RACERS
Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

RANSMISSIVITY
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

RANSPIRANTS
Reducing Phreatophyte Transpiration,
W79-01562 3B

RANSPIRATION
A Nondestructive Approach to Reducing Riparian Transpiration,
W79-01586 3B

RANSPIRATION RATES
Reducing Phreatophyte Transpiration,
W79-01562 3B

REATMENT
mprovement and Evaluation of Techniques for he Mechanical Removal and Utilization of xcess Aquatic Vegetation,
W79-01584 4A

REATMENT FACILITIES
dventures in Designing for 1984 Effluent Reuction,
W79-01608 5G

pill Containment and Effluent Management rogram at the Hopewell Mill, Continental orest Industries, The Continental Group, Inc.,
W79-01614 5D

esign and Operation of Great Northern Paper ompany's Secondary Treatment Facilities at ast Millinocket, Maine,
W79-01616 5D

CKLE-BED REACTORS
rickle-Bed Reactor Performance, Part II: Retion Studies,
W79-01566 5D

TRICKLE BEDS
Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

TRICKLE IRRIGATION
Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

TROUT
Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

TURBIDITY
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

Microstructure of Agglomerated Suspended Sediments in Northern Chesapeake Bay Estuary,
W79-01923 2L

TURF GRASSES
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

TURGIDITY
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

TWO-PHASE FLOW
Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

TYPE I WETLANDS
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

ULTRAVIOLET LIGHT
UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

ULTRAVIOLET RADIATION
'Oxyphotolysis' -- Process for Effluent Contaminants,
W79-01604 5D

UNITED STATES
United States Participation in the International Hydrological Program 1975-.
W79-01509 2A

Hydrologic Problems in Karst Regions.
W79-01932 2F

Alpha Radiation Monitoring of National Park Service Administered Caves in United States,
W79-01943 2F

UNSATURATED FLOW
A Finite Element Weighted Residual Solution to One-Dimensional Field Problems,
W79-01558 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law,
W79-01725 2G

Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

UNSTEADY FLOW
Two-Dimensional Unsteady Water Flow in Unsaturated Porous Media,
W79-01556 2G

Finite Element Solution of Two-Dimensional Unsteady and Unsaturated Flow in Porous Media.
W79-01560 2G

Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2F

UPPER COLUMBIA RIVER (WA)
The Upper Columbia Navigation Proposal.
W79-01843 4A

URANIUM
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

URANIUM COMPOUNDS
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

URANIUM MONAZITE
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

URANIUM RADIOISOTOPES
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

URBAN HYDROLOGY
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

URBAN LAND USE
A Land Study for Downtown Lake Charles,
W79-01838 6B

URBAN PLANNING
A Land Study for Downtown Lake Charles,
W79-01838 6B

URBAN RUNOFF
The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

URBAN SOCIOLOGY
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

URBANIZATION
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

UREAS
Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

UREAS

Nitrogen Release Characteristics of Isobutylidene Diurea and its Effectiveness as a Source of N for Flue-Cured Tobacco,
W79-01841 3F

USSR
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

Variations in the Duration of Stable Snow Cover in the USSR,
W79-01506 2C

Problems in Automating the Monitoring of Surface Water Chemistry,
W79-01507 5A

UTAH
Major Element Geochemistry of Lake Powell,
W79-01511 2H

Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857 4A

VEGETATION
Preliminary Guide to Wetlands of the West Coast States; Major Associations and Communities Identified.
W79-01665 2I

VEGETATION EFFECTS
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

VEGETATION ESTABLISHMENT
Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

VICTORIA
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

VIRGINIA
Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

VIRUSES
Viruses in Finished Water: The Occoquan Experience,
W79-01577 5A

VOLLENWEIDER MODELS
Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

VOLUMETRIC ANALYSIS
Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

WABASH RIVER
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

WABASH RIVER BASIN
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

WABASH RIVER BASIN PLANNING
Wabash River Basin Comprehensive Study. Vol I. Main Report,
W79-01830 6B

WAIRAU CREEK (NEW ZEALAND)
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

WALES
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

WALKER BRANCH WATERSHED (TENN)
Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies,
W79-01947 2A

WASHINGTON
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

The Upper Columbia Navigation Proposal.
W79-01843 4A

Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

WASTE DISPOSAL
Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

Utilization and Disposal of Liquid Manure at Small Available Space, (In German),
W79-01640 5E

Process and Apparatus to Treat Putrefactive Waste from Raw Fish and Meat.
W79-01647 5D

Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

WASTE DISPOSAL SITE
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

WASTE DISPOSAL SITES
A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

WASTE HEAT MANAGEMENT
Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

WASTE REUSE
Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

WASTE TREATMENT
Livestock Farming and Environmental Protection, (In German),
W79-01605 5D

Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

Utilization and Disposal of Liquid Manure at Small Available Space, (In German),
W79-01640 5E

WASTE WATER DISPOSAL
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01774 5C

Early Conflicts Over Effluent Irrigation in Missouri's Ozarks,
W79-01971 6E

Subsurface Water Behavior and Sewage Effluent Irrigation in the Missouri Ozarks,
W79-01972 5E

Mathematical Models of Dissolved Oxygen Concentration in Fresh Water,
W79-01998 5C

WASTE WATER (POLLUTION)
Report of Waste Source Inventory and Evaluation, Dade County, Florida.
W79-01834 5C

WASTE WATER TREATMENT
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

Feasibility of Recycling Laundry Wastewater at Military Quartermaster Laundries,
W79-01574 5D

Development of Technique for Detection of Low Molecular Weight Contaminant in Product Water from Water Purification or Water Reuse Systems,
W79-01578 5A

UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

Clean Up Mixed Waste Streams -- The Tank Truck Washing Example.
W79-01583 5D

Technical-Economical Solution to the Problem of Effluents in an Integrated Paper Mill (Solucion tecnico-economica del problema de efluente en una plant papelera integrada en operacion),
W79-01593 5D

Disk Filters for Effluent Purification (Diskovyj fil'try dlya ochistki stochnykh vod),
W79-01594 5D

Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide)
W79-01596 5D

Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

Characterization of Various Condensate Streams in the Kraft Process,
W79-01601 5D

Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zanieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

'Oxyphotolysis' -- Process for Effluent Contaminants,
W79-01604 5D

Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

Studies of Membrane Processes for Pulp Mill Pollution Control,
W79-01611 5D

Spill Containment and Effluent Management Program at the Hopewell Mill, Continental Forest Industries, The Continental Group, Inc.,
W79-01614 5D

Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

The Relationship of Biological Population to Activated Sludge Plant Performance,
W79-01619 5D

Reduction of the Water-Polluting Discharges from a Bleached Sulfate Pulp Mill (Reduction de la charge de pollution de l'eau provenant d'une usine de pate au sulfate blanchie),
W79-01625 5D

Biological Method for Purifying Kraft Pulp Mill Condensates,
W79-01626 5D

Process and Apparatus to Treat Putrefactive Waste from Raw Fish and Meat.
W79-01647 5D

Kanawha River Investigation of Water Quality and Water Pollution Control Practices. Volume II: Reports of Industrial Investigations on Seven Industries.
W79-01654 5D

Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

Report of Waste Source Inventory and Evaluation, Dade County, Florida.
W79-01834 5G

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

Process for the Purification of Industrial Effluents,
W79-01874 5D

Method for Treating Aqueous Wastes Containing at Least 1% Proteinaceous Matter,
W79-01875 5D

Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

Device for Treating Waste Water,
W79-01877 5D

Apparatus for Purifying Waste Waters,
W79-01880 5D

Sludge Settling and De-Watering Apparatus,
W79-01881 5D

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

Method and Apparatus for Purification of Water,
W79-01886 5D

Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

Liquid Waste Processing System,
W79-01890 5D

Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information,
W79-01978 5D

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

WASTEWATER IRRIGATION

Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

WASTEWATER MANAGEMENT

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

WASTEWATER TREATMENT

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

WATE PROPERTIES

Solar Photolysis of Water,
W79-01883 2K

WATER ANALYSIS

Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

Measurement of Total Organic Concentration in Water,
W79-01600 5A

Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5A

WATER CHEMISTRY

Problems in Automating the Monitoring of Surface Water Chemistry,
W79-01507 5A

Major Element Geochemistry of Lake Powell,
W79-01511 2H

The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

WATER CONSERVATION

Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

Components of a Successful In-Mill Close Up Program,
W79-01613 5D

Sprinkler Irrigation Practices and Water Losses: Water Shortages Underline Need for Conservation,
W79-01673 3F

Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)

Rationalization and Environmental Problems of Beamhouse Operations,
W79-01778 5D

WATER CONTROL

Information for Reservoir Control in the Northumbrian Water Authority,
W79-01502 4A

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

WATER COSTS

Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

WATER DEPTH

Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes,
W79-01637 7B

WATER HARVESTING

Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

WATER LAW

Innovative Management Concept for 208 Planning,
W79-01848 5G

Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6E

WATER LEVEL FLUCTUATIONS

Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes,
W79-01637 7B

Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

WATER MANAGEMENT

Dolomitization in the Floridan Aquifer,
W79-01749 2F

WATER MANAGEMENT (APPLIED)
Information for Reservoir Control in the Northumbrian Water Authority,
W79-01502 4A

Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

On the Management of Karst Aquifers in Saudi Arabia,
W79-01962 2F

Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

WATER MILFOIL
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

WATER POLICY
On Optimal Regulation Policies for Certain Multi-Reservoir Systems,
W79-01731 4A

Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6E

WATER POLLUTANT TREATMENT
Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores,
W79-01572 5D

WATER POLLUTION
The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

The West Branch Shabakunk Creek: A Surveillance Report of Physical Conditions and Biological Health,
W79-01543 5C

Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

Viruses in Finished Water: The Occoquan Experience,
W79-01577 5A

Kanawha River Investigation of Water Quality and Water Pollution Control Practices. Volume II: Reports of Industrial Investigations on Seven Industries.
W79-01654 5D

Feedlot Pollution: A Solvable Problem.
W79-01671 5B

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

Report of Waste Source Inventory and Evaluation, Dade County, Florida.
W79-01834 5G

Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure,
W79-01946 2A

Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

Early Conflicts Over Effluent Irrigation in Missouri's Ozarks,
W79-01971 6E

WATER POLLUTION CONTROL
Clean Up Mixed Waste Streams -- The Tank Truck Washing Example.
W79-01583 5D

Potential for an Improved Return on Investment in the Production of Wood Fiberboard Using the Wet Process (Moznosti zvysenia efektivnosti vyroby drevovlaknitych dosak mokrym sposobom),
W79-01595 5D

Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5G

Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612 5D

Austrian National Report on Non-Waste Technology,
W79-01621 3E

How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

Two Examples of Low Emission Technologies in the Pulp and Paper Industry,
W79-01627 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

Oil and Hazardous Substances Pollution Contingency Plan. Region VIII. Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.
W79-01842 5G

Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

WATER POLLUTION EFFECTS
Impact of Residual Biosolids on Receiving Water Quality,
W79-01609 5C

Biological Impact of Various Chlorinated Phenolics and Related Compounds on Daphnia Magna,
W79-01618 5C

Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

Temperature Requirements of Tilapia Zillii,
W79-01668 5C

Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form,
W79-01670 5C

Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5C

Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants,
W79-01674 5C

Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

Temperature Adaptation in the Freshwater Snail, Helisoma Trivolvis (Say),, in an Artificially Heated Reservoir in the Southeastern United States,
W79-01681 5C

Controlled Ecosystem Pollution Experiment. Effect of Mercury on Enclosed Water Columns. VIII. Summary of Results,
W79-01691 5C

Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard)
W79-01700 5C

Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

Impact of Offshore Oil and Gas Development on the Coastal Zone: Reforming the Impact Assessment Process,
W79-01783 6G

Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

rine Biological Effects of OCS Petroleum velopment,
9-01788 5C

SEAP: An Overview and a Context for dies on Biological Effects,
9-01789 5C

ıte and Chronic Toxicity, Uptake and Depur-n, and Sublethal Response of Alaska Marine ganisms to Petroleum Hydrocarbons,
9-01790 5C

lethal Effects of Petroleum Hydrocarbons Trace Metals Including Biotransformations, Reflected by Morphological, Physiological, nological, and Behavioral Indices,
9-01791 5C

ogical Fate of Metals in Fish,
9-01792 5C

Effects of Alaskan Crude Oil on Flatfish, the Prevalence of fish Pathology in Alaskan ine Waters.
9-01793 5C

siological and Behavioral Effects,
9-01794 5C

rphology,
9-01795 5C

rview,
9-01796 5C

ısport, Retention, and Effects of the Water-ble Fraction of Cook Inlet Crude Oil in erimental Food Chains,
9-01797 5C

vailability of Hydrocarbons and Heavy als to Marine Detritivores from Oil-Impact-ediments,
9-01798 5C

vity-Directed Fractionation of Petroleum,
9-01799 5C

ntial Interaction of Microorganisms and ıtants from Petroleum Development,
-01800 5C

robial Activity and Crude Oil-Microbial In-ctions in Water and Sediments,
-01801 5C

ence of Petroleum on Egg Formation and ryonic Development in Seabirds,
-01802 5C

cts of Petroleum Exposure on the Breeding ogy of the Gulf of Alaska Herring Gull ıp (Larus Argentatus X Larus cescens)M,
-01803 5C

cts of Oiling on Temperature Regulation in Otters,
-01804 5C

Overview of NOAA's Energy Resources ect on Fate and Effects of Contaminants in ne Ecosystems and Organisms,
-01805 5C

ble Trace Metal Mobilization of Selected e Elements from Oil-Impacted Sediments,
-01807 5C

Effects of Petroleum Hydrocarbons on noreception in Dungeness Crab Cancer Ma-r.
-01808 5C

active Effects of Residues of Hydrocar-Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

Environmental Assessment of Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol 1, Biological Studies.
W79-01811 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

Determination and Description of Knowledge of the Distribution, Abundance, and Timing of Salmonids in the Gulf of Alaska and Bering Sea. A Supplement,
W79-01815 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chukchi Sea, and Kotzebue Sound,
W79-01817 5C

Environmental Assessment of the Alaskan Continental Shelf Final Reports of Principal Investigators, Vol 2. Biological Studies.
W79-01818 5C

Environmental Assessment of the Alaskan Continental Shelf. Final Reports of Principal Investigators, Vol. 3. Biological Studies.
W79-01822 5C

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

WATER POLLUTION SOURCES

Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

Bacterial Aerosols from Cooling Towers,
W79-01694 5C

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

Oil and Hazardous Substances Pollution Contingency Plan. Region VIII. Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming.
W79-01842 5G

Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

WATER POLLUTION TREATMENT

Examination of the Problem of Recuperative Treatment of Waste Water in the Chemical Industry (Consideratii Asupra Problemei Epurari Recuperative A Apelor Reziduale),
W79-01579 5D

Adsorbent Process for Oily Materials,
W79-01864 5G

Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

Method and Means of Treating Water Wells,
W79-01871 3B

Process for the Purification of Industrial Effluents,
W79-01874 5D

Method for Treating Aqueous Wastes Containing at Least 1% Proteinaceous Matter,
W79-01875 5D

Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

Device for Treating Waste Water,
W79-01877 5D

Sludge Settling and De-Watering Apparatus,
W79-01881 5D

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

Oil Spill Retrieval System,
W79-01889 5G

Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

WATER PURIFICATION

Trickle-Bed Reactor Performance, Part II: Reaction Studies,
W79-01566 5D

Development of Technique for Detection of Low Molecular Weight Contaminant in Product Water from Water Purification or Water Reuse Systems,
W79-01578 5A

UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

Method of Separation of Fluoride Ion From Water,
W79-01873 5F

Method and Apparatus for Purification of Water,
W79-01886 5D

Liquid Waste Processing System,
W79-01890 5D

WATER QUALITY
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Geochemistry of Ground Water, Southwestern Missouri,
W79-01535 5B

Impact of Residual Biosolids on Receiving Water Quality,
W79-01609 5C

Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5A

Consumer Attitudes Toward Taste and Odor in Water,
W79-01739 6B

Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

Report of Waste Source Inventory and Evaluation, Dade County, Florida.
W79-01834 5G

Report on the Quality of the Water of the James River, South Dakota, 1970.
W79-01837 5G

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

Reclamation of Polluted Farm Ponds,
W79-01988 5G

WATER QUALITY CONTROL
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

WATER QUALITY MANAGEMENT
Environmental Assessment of Water Quality Management Plans.
W79-01844 5G

WATER QUALITY MANAGEMENT (APPLIED)
Comprehensive Water Quality Management for the State of South Dakota. 303(E) Basin Plan for the Minnesota River Basin.
W79-01846 5G

WATER QUALITY ONTROL
Adsorbent Process for Oily Materials,
W79-01864 5G

WATER REPELLENCY
Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

WATER REQUIREMENTS
Water Requirements and Desalting in the United States of America,
W79-01582 3A

Crop Water Requirement in Relation to Climate and Soil,
W79-01712 2G

Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

WATER RESOURCES
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

Water Requirements and Desalting in the United States of America,
W79-01582 3A

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

Wabash River Basin Comprehensive Study. Vol I. Main Report,
W79-01830 6B

Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

WATER RESOURCES DEVELOPMENT
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek Patoka River, IN. Vol. II: Appendices
W79-01828

Interim Report No. 2, Wabash River I Comprehensive Study Covering Reservoir on Embarrass River, IL., and Clifty Creek Patoka River, IN. Vol. III, Appendices
W79-01829

Wabash River Basin Comprehensive Study. I. Main Report,
W79-01830

The Upper Columbia Navigation Proposal.
W79-01843

Ground-Water Development Problems As ated with Folded Carbonate-Rock Aquife the Irondale Area, Alabama,
W79-01956

The Development and Management of I Water Resources in the City of Pecs an Vicinity, Hungary,
W79-01959

WATER RESOURCES INSTITUTES
Montana's Water Resources: A Research T
W79-01541

WATER REUSE
Development of Technique for Detectio Low Molecular Weight Contaminant in Pr Water from Water Purification or Water F Systems,
W79-01578

Device for Treating Waste Water,
W79-01877

Water Reuse Highlights, A Summary Volu Wastewater Reclamation and Reuse Info tion,
W79-01978

WATER SERVICE ORGANIZATIONS
Water Resources Appraisal for Hydroel Licensing, Kern River Basin, California.
W79-01835

WATER SOFTENING
Water Softening System,
W79-01878

Treatment of Aqueous Systems,
W79-01887

WATER SOURCES
Geothermal Power and Water Production ies at the University of California,
W79-01546

Method and Means of Treating Water V
W79-01871

WATER-SPREADING BASINS
Artificial Ground-Water Recharge as a W Management Technique on the Southern Plains of Texas and New Mexico,
W79-01992

WATER STORAGE
Storage Properties of Fractured Formation
W79-01950

WATER SUPPLY
Information for Reservoir Control in the N umbrian Water Authority,
W79-01502

Experience in Artificial Ground-Water charge for Water Supply in Lithuania,
W79-01508

Management of Local Water Systems in bama,
W79-01536

Viruses in Finished Water: The Occoquan Experience,
W79-01577 5A

Current Problems in the Rational Exploitation of Karst Water,
W79-01958 2F

The Development and Management of Karst Water Resources in the City of Pecs and its Vicinity, Hungary,
W79-01959 2F

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

Hydrological Problems of Jufra Well Field, Libya,
W79-01963 2F

The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

WATER SUPPLY DEVELOPMENT
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

WATER SYSTEMS
Management of Local Water Systems in Alabama,
W79-01536 6E

WATER TEMPERATURE
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

Filter-Feeding Ethology of Benthic Invertebrates (Ascidians). V. Influence of Temperature on Pumping, Filtration, and Digestion Rates and Rhythms in Phallusia Mamillata,
W79-01653 5C

Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

WATER TREATMENT
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

Method of Separation of Fluoride Ion From Water,
W79-01873 5F

Water Softening System,
W79-01878 5F

Method and Apparatus for Purification of Water,
W79-01886 5D

Treatment of Aqueous Systems,
W79-01887 8G

WATER USE
Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

WATER UTILIZATION
Water Requirements and Desalting in the United States of America,
W79-01582 3A

How to Conduct a Wastewater Survey: Part II - Developing Waste Stream Profiles,
W79-01760 5C

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

WATER WAVES
Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

WATER WELLS
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

Method and Means of Treating Water Wells,
W79-01871 3B

Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

WATER YIELD
Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

WATER YIELD IMPROVEMENT
Method and Means of Treating Water Wells,
W79-01871 3B

WATERFOWL
Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife,
W79-01635 6B

WATERLOGGING
Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

WATERSHEDS (BASINS)
The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure,
W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies,
W79-01947 2A

WAVE FORCES
Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

WAVES (WATER)
Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

On the Excitation of Edge Waves on Beaches,
W79-01914 2L

WEATHERING
Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

WEIRS
Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

Manoeuverable Weir,
W79-01870 8G

WELL PLUGS
How to Insure a Good Bridge Plug Job,
W79-01549 8F

WELLS
How to Insure a Good Bridge Plug Job,
W79-01549 8F

WEST COAST STATES (US)
Preliminary Guide to Wetlands of the West Coast States; Major Associations and Communities Identified.
W79-01665 2I

WEST PALM BEACH (FL)
Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

WEST VIRGINIA
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2F

The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

WETLAND PROTECTION ACT (MASSACHUSETTS)
Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

WETLANDS
Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife.
W79-01635 6B

WETLANDS

Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee,
W79-01638 7B

The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

Remote Sensing of Wetlands,
W79-01642 7B

A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W79-01643 5C

Wetland Plant Communities Along the Eastern Shoreline of Lake Ontario,
W79-01644 2I

Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

Preliminary Guide to Wetlands of the West Coast States; Major Associations and Communities Identified.
W79-01665 2I

WETTABILITY

The Use of Nonionic Surfactants on Soils,
W79-01571 2G

WETTING

Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

WETTING AGENTS

Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

WHEAT

Root-Sink Descriptions of Water Supply to Dryland Wheat,
W79-01732 3F

Effects of Cultural Practices on Grain Yield of Irrigated Wheat,
W79-01761 3F

WHEATGRASSES

Testing Salt Tolerance Variability Among Tall Wheatgrass Lines,
W79-01879 3C

WHITE-FOOTED MICE

Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

WHITEWATER RIVER (KAN)

Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5A

WILDLIFE

Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

WILDLIFE HABITAT

Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife,
W79-01635 6B

WILDLIFE HABITATS

Ecological Recovery of Realigned Stream Channels,
W79-01515 6G

Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

WISCONSIN

Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

WYOMING

Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

YOAKUM COUNTY (TEXAS)

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

YUGOSLAVIA

A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2F

Current Problems in the Rational Exploitation of Karst Waters,
W79-01958 2F

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

ZEBRAFISH

Vertebral Variation in Zebrafish (Brachydanio Rerio) Related to the Prefertilization Temperature History of Their Parents,
W79-01687 5C

ZINC

Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

ZONING

Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

ZOOPLANKTON

Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

The Effect of Temperature and Body Size on Electron Transport System Activity in Freshwater Zooplankton,
W79-01683 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

AUTHOR INDEX

EDE, B.
valuation of Peat and Granular Inoculum for ybean Yield and N Fixation Under Irrigation,
79-01702 3F

AMS, A. P.
acterial Aerosols from Cooling Towers,
79-01694 5C

AMS, J. A.
esponses of Stomata and Water, Osmotic, and urgor Potentials of Jojoba to Water and Salt ress,
79-01909 3C

EE, B. H.
oating Breakwater Field Assessment Program, iday Harbor, Washington,
79-01526 8B

oating Breakwaters: An Idea Whose Time Has eturned,
79-01525 8B

LSTRAND, G. M.
lpha Radiation Monitoring of National Park rvice Administered Caves in United States,
79-01943 2F

MAD, M. U.
ydrological Problems of Jufra Well Field, bya,
79-01963 2F

LEY, D. G.
fluence of Petroleum on Egg Formation and nbryonic Development in Seabirds,
79-01802 5C

N, E. W.
ruses in Finished Water: The Occoquan Expe- nce,
79-01577 5A

MU, A.
fects of Cultural Practices on Grain Yield of igated Wheat,
79-01761 3F

SSI, J.
nflower Yield and Water Use as Influenced by anting Date, Population, and Row Spacing,
79-01999 3F

Y, T.
Model for Relating Land Use and Ground- ter Quality in Southern Missouri,
79-01964 2F

ADEFF, E. S.
/-Ozone Water Oxidation/Sterilization Proc- ,
79-01581 5D

EN, S. E.
trient Uptake by Grass and Leaching Losses m Soluble and S-Coated Urea and KCl,
79-01705 3F

MARAS, R. R.
ot-Sink Descriptions of Water Supply to Dry- d Wheat,
79-01732 3F

ERSON, J. W.
availability of Hydrocarbons and Heavy tals to Marine Detritivores from Oil-Impact- Sediments,
79-01798 5C

ERSON, M. G.
stribution and Production of Sago Pondweed otamogeton Pectinatus L.) on a Northern irie Marsh,
79-01629 2I

ANDREWS, R. A.
An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

ANTHONY, R. G.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

APRIL, G. C.
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

ARDEKANI, E. R.
Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

ARMSTRONG, J. M.
Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

ARNETT, R. C.
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

ARUNKUMAR, S.
On Optimal Regulation Policies for Certain Multi-Reservoir Systems,
W79-01731 4A

Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

ASHLEY, D. A.
Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

ATHOW, R. F. JR.
Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

ATLAS, R. M.
Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

AYERS, K. C.
Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612 5D

BAKER, R. C.
Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2F

BALDI, G.
Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores,
W79-01572 5D

BAR-YOSEF, B.
Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

BARBER, C. K.
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

BARBER, S. A.
Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

BARFIELD, B. J.
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

BARNES, R. S.
Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

BARR, S. S.
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

BARTHA, R.
Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

BARTONEK, J. C.
A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

BASAN, P. B.
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

BASMACI, Y.
Model Analysis of Closed Systems in Karstic Aquifers,
W79-01952 2F

BATES, M. H.
Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

BAUDER, J. W.
Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

BAUER, A.
Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

BEAUCHAMP, E. G.
Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

BECK, B. F.
Hydrogeology of a Cave Utilized for Public Water Supply: Rio Camuy Cave, Puerto Rico, U.S.A.,
W79-01957 2F

BEISSEL, D. R.
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

BELL, A. E.
Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

BELL, C. T.
The Relationship of Biological Population to Activated Sludge Plant Performance,
W79-01619 5D

BEN-ASHER, J.
Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

BENSON, L. J.
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

BENVILLE, P. E.
Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

BERGER, J. P.
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

BERGMANN, M.
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

BERTSCH, W.
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

BESIK, F.
Apparatus for Purifying Waste Waters,
W79-01880 5D

BEST, R. G.
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

BETSON, R. P.
The Hydrology of Karst Urban Areas,
W79-01948 2A

BEZDICEK, D. F.
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

BHAGAT, P. K.
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

BHOWMIK, N. G.
Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

BIELORAI, H.
Crop Water Requirement in Relation to Climate and Soil,
W79-01712 2G

BILELLO, M. A.
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

BINGHAM, F. T.
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

BLACK, J. D. F.
Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

BLAD, B. L.
Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

BLAKE, T. R.
Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

BLANCHAR, R. W.
Profile Modification of a Fragiudalf to Increase Crop Production,
W79-01740 3F

BLANKEN, V. G.
Fields of Use and Application of Manure and Manure Disposal, (In German),
W79-01633 5E

BLASER, R. E.
Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

BLEVINS, D. G.
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

BLINN, D. W.
Summer Distribution and Reproductive Status of Fish of the Colorado River in Grand Canyon National Park and Vicinity, 1975,
W79-01585 6B

BOAG, A. J.
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

BOGGESS, S. F.
Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

BOHN, A.
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

BOLAND, R. A. JR.
Effects of Construction of Liberty State Par
Hydraulic Characteristics of New York Ha
Hydraulic Model Investigation,
W79-01518

BOPP, R. F.
Sources of Heavy Metals in Sediments o
Hudson River Estuary,
W79-01678

BORGMANN, U.
The Effect of Temperature and Body Siz
Electron Transport System Activity in F
water Zooplankton,
W79-01683

BORTON, D. L.
Impact of Residual Biosolids on Rece
Water Quality,
W79-01609

BOULTON, N. S.
Flow to a Well in an Unconfined Fract
Aquifer,
W79-01953

BOYD, C. E.
Consequences of Periodic Application
Copper Sulfate and Simazine for Phytopla
Control in Catfish Ponds,
W79-01672

BRADFORD, J. M.
Profile Modification of a Fragiudalf to Inc
Crop Production,
W79-01740

BRASWELL, J. W.
Water Softening System,
W79-01878

BRETZ, R. F.
Arsenic Levels in the Surface and Gr
Waters Along Whitewood Creek, Belle Fo
River, and a Portion of the Cheyenne
South Dakota,
W79-01897

BRICHON, G.
Effect of Environmental Temperature on
synthesis of Liver Phosphatidyl-Choline i
Trout (Salmo Gairdnerii),
W79-01680

BROCKETT, B. E.
Environmental Analyses in the Kootenai
Region, Montana,
W79-01512

BROOKS, A. S.
The Effects of Intermittent Chlorinatio
Coho Salmon, Alewife, Spottail Shiner,
Rainbow Smelt,
W79-01753

BROSSET, C.
Possible Changes in Aerosol Composition
to Departure from Equilibrium Cond
During Sampling,
W79-01554

BROWN, D. W.
The NOAA National Analytical Facility
Status Report,
W79-01806

BROWN, E. S.
Demersal Fish and Shellfish Resources
Gulf of Alaska from Cape Spencer to U
Pass 1948 - 1976. A Historical Review. V
1,
W79-01819

Demersal Fish and Shellfish Resources
Gulf of Alaska from Cape Spencer to U

ss 1948 - 1976. A Historical Review. Volume
79-01820 5C

emersal Fish and Shellfish Resources of the
lf of Alaska from Cape Spencer to Unimak
ss 1948 - 1976. A Historical Review. Volume
79-01821 5C

WN, K. W.
senic Pollution from Underdrainage and
noff from Golf Greens,
79-01752 5B

WN, R. F.
tificial Ground-Water Recharge as a Water-
nagement Technique on the Southern High
ins of Texas and New Mexico,
79-01992 4B

WNELL, D. H. JR.
nulation of Fluid-Rock Interactions in a Geo-
rmal Basin,
79-01516 2F

WNER, A. B.
ll Containment and Effluent Management
gram at the Hopewell Mill, Continental
est Industries, The Continental Group, Inc.,
9-01614 5D

CE, R. R.
note Sensing of Water Levels in Small-Diam-
Wells,
9-01924 7B

CH, J. C.
Finite Element Solution to a General Two-
nensional Nonsymmetric Parabolic Partial
ferential Equation,
9-01559 2G

inite Element Weighted Residual Solution to
-Dimensional Field Problems,
9-01558 2G

CH, J. C. JR.
te Element Solution of Two-Dimensional
teady and Unsaturated Flow in Porous
lia.
9-01560 2G

nsient Two-Dimensional Problems Utilizing
Least Squares Algorithm,
9-01557 2G

o-Dimensional Unsteady Water Flow in Un-
rated Porous Media,
9-01556 2G

IN, H. D.
rovement and Evaluation of Techniques for
Mechanical Removal and Utilization of
ess Aquatic Vegetation,
9-01584 4A

OLD, W. H.
sumer Attitudes Toward Taste and Odor in
er,
9-01739 6B

LEY, F. G.
of Dredged Material Islands by Colonical
irds and Wading Birds in New Jersey,
-01658 5E

LEY, J. W.
vative Management Concept for 208 Plan-
-01848 5G

ON, D. J.
ence of Karst on Engineering in Ireland,
-01973 8G

BURK, C. J.
The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

BUSH, R. F.
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

BUTLER, H. L.
Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

CAIRN, J. JR.
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

CALDWELL, A. C.
Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

CALI, F. J.
Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

CAMPBELL, G. S.
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

CARLES, D. J.
The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

CARLSON, R. F.
Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

CARR, R. S.
Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

CARROLL, B.
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

CARSON, P. L.
Relationship Between Soil Test and Small Grain Response to P Fertilization in Field Experiments,
W79-01786 3F

CARTEE, C. P.
Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

CARTER, J. G. T.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

CASEY, J. P.
Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

CASSEL, D. K.
Alfalfa Water Use and Production on Dryland and Irrigated Sandy Loam,
W79-01715 3F

Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

CATAPANE, E. J.
The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

CHAN, C. H.
Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

CHANDRASEKARAN, K.
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

CHAPMAN, V. J.
Submerged Vegetation of the Rotorua and Waikato Lakes 3. Lake Rerewhakaiitu,
W79-01652 2H

CHARLIE, W. A.
Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

CHELTON, R. G.
Device for Treating Waste Water,
W79-01877 5D

CHENG, H-D.
Computer Model for Predicting Pollution in the Missouri,
W79-01905 5B

CHIEN, Y. T.
Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

CHILCOTE, D. D.
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

CHON, K.
On Optimal Regulation Policies for Certain Multi-Reservoir Systems,
W79-01731 4A

CHOW, C.-K.
Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores,
W79-01572 5D

CHOW, T. J.
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

CHRISTENSEN, D. R.
Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

CHRISTIAN, R.
Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

CHU, T. Y. J.
Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants,
W79-01674 5C

CLARK, J.
Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

CLAYTON, J.
Submerged Vegetation of the Rotorua and Waikato Lakes 3. Lake Rerewhakaiitu,
W79-01652 2H

CLIGNETT, A. H.
Short-Term Variation of the Chemical Composition of the Niagara River,
W79-01831 5A

COHEN, M. H.
Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

COHEN, Y.
Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

COLAMUSSI, A.
Collapsible and Expansible Barrage,
W79-01869 8A

Manoeuverable Weir,
W79-01870 8G

COLE, C. R.
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

COLE, R. A.
Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

CONDRA, G. D.
The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

CONDREN, A. J.
Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

CONKEY, J.
Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

CONLEY, K. A.
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

COONEY, R. T.
Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

COOPER, S. R.
Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

CORE, I. K.
Spill Containment and Effluent Management Program at the Hopewell Mill, Continental Forest Industries, The Continental Group, Inc.,
W79-01614 5D

COSTA, D.
Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

COSTA, H. S.
Impact of Residual Biosolids on Receiving Water Quality,
W79-01609 5C

COTNOIR, L. J.
Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

CRECELIUS, E. A.
Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

CRISS, R. R.
An Unobtrusive Measure of the Recreational Value of a Lake,
W79-01986 6B

CROLEY, T. E. II
A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

Ralston Creek Hourly Precipitation Model,
W79-01727 2B

CROSMUN, S. T.
Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

CRYER, J. D.
Ralston Creek Hourly Precipitation Model,
W79-01727 2B

CUNNY, R. W.
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

CZAPPA, D. J.
Components of a Successful In-Mill Close Up Program,
W79-01613 5D

D'ALBA, L.
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

D'AMADDIO, E. R.
Liquid Waste Processing System,
W79-01890 5D

DALE, R. F.
A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

DALTON, F. N.
Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

DAMBRUCH, L. E.
Treatment of Bleach Plant Effluents by C
bined Reverse Osmosis and Freeze Concen
tion Process,
W79-01610

DAME, R. F.
The Influence of Constant and Cyclic Accli
tion Temperatures on the Metabolic Rates
Panopeus Herbstii and Uca Pugilator,
W79-01685

DANCETTE, C.
Analysis of Fallow-Farming Systems in Se
Arid Africa Using a Model to Simulate
Hydrologic Budget,
W79-01785

DANKS, H. V.
Some Effects of Photoperiod, Temperature,
Food on Emergence in Three Species of Chi
omidae (Diptera),
W79-01688

DARNELL, J. R.
Geothermal Power and Water Production S
ies at the University of California,
W79-01546

DARR, J. M.
Geochemistry of Ground Water, Southwes
Missouri,
W79-01535

DAVENPORT, D. C.
A Nondestructive Approach to Reducing Ri
ian Transpiration,
W79-01586

Reducing Phreatophyte Transpiration,
W79-01562

DAVIDOVSKY, M.
Technical-Economical Solution to the Prob
of Effluents in an Integrated Paper Mill (S
cion tecnico-economica del problema
efluente en una plant papelera integrada en c
acion),
W79-01593

DAVIS, E. L.
Genetic Damage to a Fern Population Gro
in a Polluted Environment: Segregation and
scription of Gametophyte Mutants,
W79-01745

DAVIS, N. D.
Fungal Degradation of Anaerobically Dige
Sewage Sludge,
W79-01547

Mycoflora of Activated Sewage Sludge,
W79-01548

DAVIS, R. A. JR.
Seasonal Variation in Beach Erosion and
mentation on the Oregon Coast,
W79-01920

DAWSON, R.
Leather Tanning Industry-Sludge Prob
Ahead,
W79-01779

DAY, A. D.
Effects of Cultural Practices on Grain Yie
Irrigated Wheat,
W79-01761

DAY, J. B. W.
The Use of Inclined Boreholes for Well D
opment,
W79-01503

DE LA CRUZ, A. A.
The Production of Pulp from Marsh Grass
W79-01630

EJU, R. A.
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

ENSON, K. H.
Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

ENTRY, W.
Vertebral Variation in Zebrafish (Brachydanio Rerio) Related to the Prefertilization Temperature History of Their Parents,
W79-01687 5C

EVAY, L.
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

EWALLE, D. R.
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

ENER, U. L.
Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547 5E

Mycoflora of Activated Sewage Sludge,
W79-01548 5E

LOUIE, J. M.
Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

LYUNAS, I. P.
Experience in Artificial Ground-Water Recharge for Water Supply in Lithuania,
W79-01508 4B

SKIN, M. H.
Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

XON, K. R.
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W79-01643 5C

XON, R. M.
Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

RSEY, T. E.
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

UGLAS, A. V.
Analysis of Seasonal Persistence of Climate in Nebraska,
W79-01538 2B

ABLOS, C. J. W.
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

EYER, L. D.
North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

ORI, M.
Regulated Flow-Reducing Device Particularly Useful for Drip Irrigation,
W79-01882 3F

DRUMMOND, D. W.
Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

DUBLE, R. L.
Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

Sprinkler Irrigation Practices and Water Losses: Water Shortages Underline Need for Conservation,
W79-01673 3F

DUCKSTEIN, L.
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

DUGAL, H. S.
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

DUICH, J. M.
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

DUMOND, D. M.
A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

DUNCAN, W. J.
Management of Local Water Systems in Alabama,
W79-01536 6E

DURABB, E. J.
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

DURKIN, P. R.
Biological Impact of Various Chlorinated Phenolics and Related Compounds on Daphnia Magna,
W79-01618 5C

EASTY, D. B.
Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

EBINUMA, O.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

EDWARDS, D. C.
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

EDWARDS, J.
Information for Reservoir Control in the Northumbrian Water Authority,
W79-01502 4A

ELEUTERIUS, L. N.
The Salt Marsh Flora of Mississippi,
W79-01632 2I

ELI, R. N. II
Ralston Creek Hourly Precipitation Model,
W79-01727 2B

ELLIS, J. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

ELSAWAY, E. M.
Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

ENEGESS, D. N.
Liquid Waste Processing System,
W79-01890 5D

ENGLEHART, P. J.
Analysis of Seasonal Persistence of Climate in Nebraska,
W79-01538 2B

ERICKSON, C. J.
Forage Yield and Fertilizer Recovery by Three Irrigated Perennial Grasses as Affected by N Fertilization,
W79-01885 3F

ERLENKOTTER, D.
Investment Planning for Colorado River Salinity Control,
W79-01587 5G

Sequencing Competitive Expansion Projects,
W79-01561 6A

ESCOFFIER, F. F.
Hydraulics and Stability of Tidal Inlets,
W79-01519 8B

ESKRIDGE, D. S.
Construction Methods which Recognize the Mechanics of Sink hole Development,
W79-01974 8G

ETHRIDGE, W. J.
Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

EVANS, D. W.
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

EXLEY, I. S.
Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

FALCO, P. K.
Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

FALLIS, B. W.
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathcona Sound, Northwest Territories,
W79-01552 5B

FARRELL, F. C.
UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

FEDER, H. M.
Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chukchi Sea, and Kotzebue Sound,
W79-01817 5C

FEDORENKO, Z. P.
Effect of Ozone and Chlorine on 3,4-Benzopyrene During the Disinfection of Water (Deystviye Ozona I Khlora Na 3,4-Benzpiren Priobezzarazhivanii Vody),
W79-01575 5D

FEKETE, K.
The Development and Management of Karst Water Resources in the City of Pecs and its Vicinity, Hungary,
W79-01959 2F

FERGUSON, R.
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

FERGUSON, R. B.
Geochemical Interpretation of Kings Mountain, North Carolina, Orientation Area,
W79-01912 5B

FERGUSON, T. L.
State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

FIELDS, D. E.
Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure,
W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies,
W79-01947 2A

FILATOVA, T. N.
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

FILECCIA, R. J.
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

FINAN, M. A.
Treatment of Aqueous Systems,
W79-01887 8G

FISCHER, K.
Removal of Components from Wastewaters Generated in Textile Finishing Processes. Part II. Separation of Contents from Wastewaters. Size (Eliminierungen von Inhaltsstoffen in Abwassern der Textilveredlung-Teil II Trennung con Abwasser-Inhaltsstoffen, Schlichte,
W79-01757 5D

FISK, D. W.
Exploration and Environmental Investigation of the Peacock Springs Cave System,
W79-01961 2F

FIXEN, P. E.
Relationship Between Soil Test and Small Grain Response to P Fertilization in Field Experiments,
W79-01786 3F

FLETCHER, B. P.
Indian Creek Pumping Station, Mankato, Minnesota; Hydraulic Model Investigation,
W79-01663 8C

FLETCHER, G. L.
Seasonal Dynamics of Cu2+, Zn2+, Ca2+, and Mg2+ in Gonads and Liver of Winter Flounder (Pseudopleuronectes Americanus): Evidence for Summer Storage of Zn for Winter Gonad Development in Females,
W79-01677 5C

FOGEL, M.
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

FORD, S. W.
Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

FORSTER, A.
Liquid Manure and Environment Protection, (In German),
W79-01628 5E

FOSTER, I. D. L.
The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

FOWLER, G. A.
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

FOX, J. D.
Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

FOX, P. M.
Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

FOX, W. T.
Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

FRANCO, J. J.
Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

FRANKLIN, M. E.
Characterization of Various Condensate Streams in the Kraft Process,
W79-01601 5D

FREDINE, C. G.
Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife,
W79-01635 6B

FREY, R. W.
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

FROHLICH, R. K.
Geophysical Investigations Over Karst Water in Southeastern Missouri,
W79-01942 2F

FROSCH, R. A.
Solar Photolysis of Water,
W79-01883 2K

FUCHS, M.
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

FULLER, R. R.
Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5G

GABLE, M.
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds,
W79-01589 2H

GABOVICH, R. D.
Effect of Ozone and Chlorine on 3,4-Benzopyrene During the Disinfection of Water (Deystviye Ozona I Khlora Na 3,4-Benzpiren Priobezzarazhivanii Vody),
W79-01575 5D

GAINES, J. L.
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

GARBETT, M.
Bacterial Aerosols from Cooling Towers,
W79-01694 5C

GARDNER, W. R.
Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

GARG, S. K.
Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

GARRISON, E.
Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

GARTON, E. R. JR.
The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

GATTO, L. W.
Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

GAUTHIER, J. J.
Method for Adenosine 5'-Triphosphate Measurement on Coke Waste Activated Sludge,
W79-01723 5D

GEER, R. D.
Predicting the Anaerobic Degradation of Organic Chemical Pollutants in Waste Water Treatment Plants from Their ELectrochemical Reduction Behavior,
W79-01539 5B

GEORGE, A. I.
Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

GEPHART, R. E.
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

GETTLEMAN, B. L.
Incentives for Improved Water-Use Efficiency Implementation Phase,
W79-01836 3F

GEURTSEN, A. A.
Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5C

GILLETTE, J. F.
Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III, W79-01531 4A

GILMAN, B. A.
Wetland Plant Communities Along the Eastern Shoreline of Lake Ontario, W79-01644 2I

GINN, L. H.
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front, W79-01710 7B

GISKIN, M.
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol, W79-01699 2G

GLANTZ, P. J.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I, W79-01902 5C

GLUECKSTERN, P.
Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination, W79-01580 3A

GOICOECHEA, A.
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands, W79-01730 5G

GOLDBERG, D.
Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields, W79-01990 3F

GOLDSTEIN, R.
Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results, W79-01755 5C

GORDON, L. I.
Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production, W79-01997 5C

GOSHORN, J.
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems, W79-01576 5D

GOTO, S.
Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores, W79-01572 5D

Mass Transfer in Packed Beds with Two-Phase Flow, W79-01567 2K

Trickle-Bed Reactor Performance, Part II: Reaction Studies, W79-01566 5D

Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects, W79-01565 5D

GRAF, W. L.
Fluvial Adjustments to the Spread of Tamarisk in the Colorado Plateau Region, W79-01919 2J

GRAFF, J. M.
Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes, W79-01637 7B

GRAHAM, G. L.
Flow Control Device for an Irrigation Ditch, W79-01868 3F

GRAU, C. R.
Influence of Petroleum on Egg Formation and Embryonic Development in Seabirds, W79-01802 5C

GRAVES, S. L.
Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama, W79-01956 2F

GREEN, M.
Occurrence of Iron Bacteria in Ground Water Supplies of Alabama, W79-01908 5B

GRICE, G. D.
Controlled Ecosystem Pollution Experiment: Effect of Mercury on Enclosed Water Columns. VIII. Summary of Results, W79-01691 5C

GRIFFITHS, R. P.
Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments, W79-01801 5C

GROSS, T. A.
Innovative Management Concept for 208 Planning, W79-01848 5G

GRUGER, E. H.
Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices, W79-01791 5C

GRUGER, E. H. JR.
Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish, W79-01809 5C

GRUTSCH, J. F.
Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process. W79-01759 5D

GUIN, J. A.
Pollution Concentrations in Runoff Water from Refuse Piles, W79-01892 5B

GUNNER, H. B.
Microfloral Response to Aquatic Weed Decomposition, W79-01746 5C

GUTIERREZ, L. A.
Toxicity Removed by Foam Separation, W79-01770 5D

HAASE, J.
Process for the Purification of Industrial Effluents, W79-01874 5D

HADAS, A.
Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program, W79-01714 2G

HAGAN, R. M.
Reducing Phreatophyte Transpiration, W79-01562 3B

HAGEDORN, C.
Use of Fecal Streptococci as Indicators of Pollution in Soil, W79-01738 5B

HAGIN, J.
Simulation of Nitrogen Processes in Soils for Estimating Fertilizer Requirements, W79-01713 2K

HAGLER, W. M.
Mycoflora of Activated Sewage Sludge, W79-01548 5E

HAGLER, W. M. JR.
Fungal Degradation of Anaerobically Digested Sewage Sludge, W79-01547 5E

HAIR, J. F. JR.
Model Aids Managerial Effectiveness in Municipal Water Systems, W79-01741 5G

HALFON, E.
The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior, W79-01993 5C

HALL, A. E.
Analysis of Fallow-Farming Systems in Semi-Arid Africa Using a Model to Simulate the Hydrologic Budget, W79-01785 2D

HALPERIA, S. T.
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office, W79-01650 6B

HAM, G. E.
Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake, W79-01782 3F

HAMISCH, F.
Mainline Installation, W79-01689 3F

HANCHER, C. W.
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors, W79-01762 5D

HANES, N. B.
Effects of Chlorination on Differentiated Coliform Groups, W79-01695 5C

HANKS, R. J.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity, W79-01734 3C

HANSON, C. L.
Forage Yield and Fertilizer Recovery by Three Irrigated Perennial Grasses as Affected by N Fertilization, W79-01885 3F

HARDIN, D. C.
The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas, W79-01894 3F

HARRISON, J.
A Land Study for Downtown Lake Charles, W79-01838 6B

HART, S. D.
Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams,
W79-01588 5B

HARWOOD, R. H.
'Oxyphotolysis' -- Process for Effluent Contaminants,
W79-01604 5D

HAUSER, W. J.
Temperature Requirements of Tilapia Zillii,
W79-01668 5C

HAWKES, J. W.
Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Morphology,
W79-01795 5C

HEATH, A. G.
Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form,
W79-01670 5C

HEATHERLY, L. G.
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

HEATON, R. D.
Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information,
W79-01978 5D

HEDGES, R. B.
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

HEDGES, T. R.
Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

HEINEMANN, D.
Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

HELGERSON, R. N.
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

HELWEG, O. J.
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

HEMPFLING, T.
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

HENDRICKSON, L. L.
Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

HERGERT, G. W.
Nitrogen Losses from Sprinkler-Applied Nitrogen Fertilizer,
W79-01893 3F

HERGOTT, S. J.
Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

HERRING, D.
A Land Study for Downtown Lake Charles,
W79-01838 6B

HESSELTINE, B. B.
Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

HEUBNER, J. D.
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

HIATT, A. J.
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

HICKEY, E. W.
Dolomitization in the Floridan Aquifer,
W79-01749 2F

HILBERT, A.
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

HILL, D. O.
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

HILLEL, D.
A Method of Promoting Penetration of Water into Tight, Sloping Soil Under Drip Irrigation,
W79-01719 3F

HIRIPI, L.
The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia,
W79-01684 5C

HOCUTT, C. H.
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

HODGINS, H. O.
Physiological and Behavioral Effects,
W79-01794 5C

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

HOEFT, R. G.
Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

HOFFMAN, G. J.
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

HOFFMAN, W.
Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

HOK, C.
Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

HOLLADAY, D. W.
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

HOLLANDSWORTH, C.
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

HOLLMAN, K. W.
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

HOLZER, G.
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

HOOPER, F. F.
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

HORIKOSHI, T.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

HORNSBY, J. S.
Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

HOWELL, S.
Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

HOWMILLER, R. P.
Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams
W79-01588 5B

HSIAO, S. I. C.
Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

HUDSON, B. C.
The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

HUFF, J. E.
Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

JGHES, M. V. JR.
Water Requirements and Desalting in the United States of America,
W79-01582 3A

JGHES, T. C.
Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

NSAKER, V. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

ISTER, J. A.
tatus of the Closed-Cycle Concept Kraft Mill t Great Lakes Paper Co.,
W79-01773 3E

AIZUMI, T.
Method and Apparatus for Purification of Water,
W79-01886 5D

AMOTO, M.
pparatus for the Continuous Measurement of ne Concentration of Oil,
W79-01867 5A

CKSON, E. B.
ffects of Cultural Practices on Grain Yield of rigated Wheat,
W79-01761 3F

UBOWSKI, W.
iruses in Finished Water: The Occoquan Experience,
W79-01577 5A

ISON, J. J.
il Spill Retrieval System,
W79-01889 5G

KINS, D.
ower Plant Cooling Water Chlorination in orthern California,
W79-01676 5C

PSON, R. W.
ydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

TT, S. C.
awl Survey of the Epifaunal Invertebrates of orton Sound, Southeastern Chukchi Sea, and otzebue Sound,
W79-01817 5C

HEM, E.
vo Examples of Low Emission Technologies the Pulp and Paper Industry,
W79-01627 5D

NSON, J. T.
ffect of Slow Release Fertilizer on Fertilizer esidues and on Yield and Composition of Flue-ured Tobacco,
W79-01736 3F

NSON, N. M.
ajor Element Geochemistry of Lake Powell,
W79-01511 2H

NSON, P.
Formation for Reservoir Control in the Northbrian Water Authority,
W79-01502 4A

NSON, R. A.
orth Slope Borough Water Study, A Background for Planning,
W79-01991 5D

JOHNSON, S. J.
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

JOHNSON, W. K.
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

JONES, C. J.
The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

JONES, E. B.
Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

JONES, N. L.
Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee,
W79-01638 7B

JONES, R. A.
Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

JOYCE, T. W.
Removal of Color from Carbonate Pulping Effluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

JUDKINS, J. F.
Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

JUNKERMANN, H.
Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

JUUL, R. B.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01774 5C

KADABA, P. K.
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

KADLEC, J. A.
A Model for Predicting the Effects of Sewage Effluent on Wetland Ecosystems,
W79-01643 5C

KAESLER, R. L.
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

KAFKAFI, U.
Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

KAKUMOTO, Y.
Method and Apparatus for Purification of Water,
W79-01886 5D

KANAI, M.
Method of Separation of Fluoride Ion From Water,
W79-01873 5F

KANEGAWA, M.
Method and Apparatus for Purification of Water,
W79-01886 5D

KAO, D. T. Y.
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

KARINEN, J. F.
Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

KARRICK, N. L.
Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

KASHEF, A-A. I.
On the Management of Karst Aquifers in Saudi Arabia,
W79-01962 2F

KASTNING, E. H.
Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

KAUDERS, R.
Austrian National Report on Non-Waste Technology,
W79-01621 3E

KAUFMAN, E.
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

KAUFMANN, M. R.
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

KEARNEY, F.
A Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1975 Program,
W79-01513 8F

KEENEY, D. R.
Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

KELLY, J. E.
Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

KELSO, G. L.
State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

KENNEDY, H. G.
Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

KERPELMAN, L. C.
Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

KETCHESON, J. W.
Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

KHAN, N. A.
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

KHAN, P.
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

KHORRAM, S.
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

KIBBEY, H. J.
Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

KILLEEN, T. J.
Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

KIMMELMAN, W. M.
Management of Local Water Systems in Alabama,
W79-01536 6E

KING, M. J.
Seasonal Dynamics of Cu2+, Zn2+, Ca2+, and Mg2+ in Gonads and Liver of Winter Flounder (Pseudopleuronectes Americanus): Evidence for Summer Storage of Zn for Winter Gonad Development in Females,
W79-01677 5C

KINNEY, E. C.
Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

KIRK, K. G.
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2F

KIRSTEN, K.
Use in the Brick Industry of Highly Discolored Fibers Recovered from the Final Effluent Clarifier of a Paper Mill (Verwertung von stark verfaerbtem Fangstoff aus der Rest-abwasserklaeranlage einer Papierfabrik in der Ziegelindustrie),
W79-01607 3E

KISS, S. G.
Sludge Settling and De-Watering Apparatus,
W79-01881 5D

KISVARSANYI, G.
Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

KLEIN, J.
Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

KLEKOWSKI, E. J. JR.
Genetic Damage to a Fern Population Growing in a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

KLINE, E. O.
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

KNIGHT, W. W.
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

KOEGEL, R. G.
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

KOENINGS, J. P.
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

KOEPPE, D. E.
Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

KOMATINA, M.
Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2F

KOOYMAN, G.
Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

KOPANEV, I. D.
Variations in the Duration of Stable Snow Cover in the USSR,
W79-01506 2C

KORN, S.
Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

KOVBA, V. A.
Disk Filters for Effluent Purification (Diskovye fil'try dlya ochistki stochnykh vod),
W79-01594 5D

KRADEL, D. C.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

KRAMER, T. T.
Bdellovibrio and the Intestinal Flora of Ver
brates,
W79-01742

KRENKEL, P. A.
Characterization and Reuse of Ash Pond
fluents in Coal-Fired Power Plants,
W79-01674

KRISTIANSEN, A.
Marine Algal Vegetation in Shallow Wa
Around the Danish Island of Saltholm,
Sound,
W79-01996

KRUH, G.
Simulation of Nitrogen Processes in Soils
Estimating Fertilizer Requirements,
W79-01713

KUBECK, A. M.
Great Lakes Shoreline Damage Survey; Mu
gon, Manistee, Schoolcraft, Chippewa, Alco
and Huron Counties, Michigan, Appendix
W79-01531

KULKARNI, G. K.
Thermal Acclimation Induced Compensatio
Biochemical Constituents of the Indian Fr
water Leech, Poecilobdella Viridis (Blancha
W79-01700

KUNZ, R. G.
Refinery Cyanides: A Regulatory Dilemma,
W79-01763

KURINNYY, I. L.
Effect of Ozone and Chlorine on 3,4-Benzop
ene During the Disinfection of Water (De
viye Ozona I Khlora Na 3,4-Benzpiren Priol
zarazhivanii Vody),
W79-01575

LACEWELL, R. D.
The Impact of Energy Shortage and Cost
Irrigation for the High Plains and Trans Pe
Regions of Texas,
W79-01894

LAIRD, A. D. K.
Geothermal Power and Water Production S
ies at the University of California,
W79-01546

LAM, D. C. L.
The Effects of Advection-Diffusion Proce
on the Eutrophication of Large Lakes, a Hy
thetical Example: Lake Superior,
W79-01993

LANE, L. J.
Partial Area Response on Small Semiarid Wa
sheds,
W79-01916

LANG, E. W.
Studies of Membrane Processes for Pulp
Pollution Control,
W79-01611

LANGE, G.
Possible Trace Metal Mobilization of Sele
Trace Elements from Oil-Impacted Sedim
W79-01807

LANGTON, D. N. III.
Effect of Soil Mixtures and Irrigation Met
on Leaching of N in Golf Greens,
W79-01777

LAPERRIERE, J. D.
Environmental Planning for an Alaskan W
Oriented Recreational Area,
W79-01900

LARICCIA, M. P.
Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

LARSEN, R.
How They're Harnessing the Sun to Pump Water,
W79-01679 3F

LASCA, N. P.
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

LATHIA, S. G.
Removal of Color from Carbonate Pulping Effluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

LAUERMANN, S. D.
The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

LAWLESS, E. W.
State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

LAWRENCE, D. K.
Morphological Variation of Elodea in Western Massachusetts: Field and Laboratory Studies,
W79-01743 5C

LAWSON, M. P.
Analysis of Seasonal Persistence of Climate in Nebraska,
W79-01538 2B

LEAF, C. F.
Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

LEE, G. F.
Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

LEENDERTSE, J. J.
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

LEES, D. C.
Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet,
W79-01824 5C

LEGGETT, J. E.
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

LEGRAND, H. E.
Karst Hydrology Related to Environmental Sensitivity,
W79-01934 2F

LEMBKE, W. D.
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

LENSINK, C. J.
A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

LESCZYNSKI, D. B.
Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

LETEY, J.
Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

The Use of Nonionic Surfactants on Soils,
W79-01571 2G

LEVEC, J.
Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

LEVIN, I.
Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

LEWIS, B. G.
Bacterial Aerosols from Cooling Towers,
W79-01694 5C

LEWIS, R. W.
Transient Two-Dimensional Problems Utilizing the Least Squares Algorithm,
W79-01557 2G

LEWIS, S.
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

LIANG, T.
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

LIEBEN, P.
Reduction of the Water-Polluting Discharges from a Bleached Sulfate Pulp Mill (Reduction de la charge de pollution de l'eau provenant d'une usine de pate au sulfate blanchie),
W79-01625 5D

LIEGEL, E. A.
Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

LILLY, J. P.
Nitrogen Release Characteristics of Isobutylidene Diurea and its Effectiveness as a Source of N for Flue-Cured Tobacco,
W79-01841 3F

LINDSEY, C. C.
Vertebral Variation in Zebrafish (Brachydanio Rerio) Related to the Prefertilization Temperature History of Their Parents,
W79-01687 5C

LINDSLEY, D.
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

LIU, H.
Computer Model for Predicting Pollution in the Missouri,
W79-01905 5B

LIU, H-A.
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

LIU, S-K.
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

LIVERMORE, D. F.
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

LOFY, R. J.
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

LOGAN, J. T.
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

LOMEN, D. O.
Linearized Moisture Flow with Loss at the Soil Surface,
W79-01704 2G

LONG, R. R.
Applications of Mixing Experiments to Estuaries,
W79-01911 2L

LOUIE, S. S-F.
Solar Radiation and Urban Heat Islands,
W79-01568 2B

LOVELL, A. D.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

LOWE, R. H.
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

LU, J. C. S.
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

LUBIENSKA, U.
Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zanieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

LUCAS, B. H.
Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

LUXMOORE, R. J.
Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

LYON, D. K.
Water Conservation in the Las Vegas Valley: Pricing and Alternative Measures,
W79-01896 3D

MACLEOD, W. D. JR.
The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

MACNAUGHTON, M. G.
The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

MALAK, N. A.
Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

MALINS, D. C.
Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Overview,
W79-01796 5C

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

MALLATT, R. C.
Optimize the Effluent System. Part 6: Biochemistry of Activated Sludge Process.
W79-01759 5D

MALLORY, R.
Drip Irrigation at Superior Farming: Water Use Cut 30%, Fertilizer 50% by This Large Corporate Farm,
W79-01690 3F

MANG, J. L.
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

MANHEIM, F. T.
Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

MANLEY, T. R.
The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

MAPLES, G.
Studies of Membrane Processes for Pulp Mill Pollution Control,
W79-01611 5D

MARCZ, M.
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

MARECHAL, B.
How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

MARGEN, P. H. E.
Hot Water Reservoir,
W79-01862 8C

MARTINSEN, D.
Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

MARUYAMA, I.
Adsorbent Process for Oily Materials,
W79-01864 5G

MASNIK, M. T.
Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

MATHERLY, J. E.
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

MATSON, R. A.
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

MATSUI, M.
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

MATSUMOTO, N.
Method and Apparatus for Purification of Water,
W79-01886 5D

MAUGHAN, O. E.
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

MCCAFFREY, C. A.
Use of Dredged Material Islands by Colonical Seabirds and Wading Birds in New Jersey,
W79-01658 5E

MCCAIN, B. B.
The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of fish Pathology in Alaskan Marine Waters.
W79-01793 5C

MCCLELLAN, T. J.
Ecological Recovery of Realigned Stream Channels,
W79-01515 6G

MCCOY, E. L.
Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

MCCROCKLIN, W. B. JR.
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

MCDANIEL, S.
The Salt Marsh Flora of Mississippi,
W79-01632 2I

MCDERMOTT, J. J.
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

MCDONALD, P.
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

MCGILL, M. R.
Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix VIII,
W79-01534 4A

Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

MCGUGAN, P. J.
The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

MCINTOSH, A. W.
Harry's Brook - A Surveillance Report of Phys
cal Conditions and Biological Health,
W79-01907 5

The West Branch Shabakunk Creek: A Survei
lance Report of Physical Conditions and Bio
logical Health,
W79-01543 5

MCKEOWN, J. J.
Impact of Residual Biosolids on Receivin
Water Quality,
W79-01609 5

MCKIM, H. L.
Environmental Analyses in the Kootenai Rive
Region, Montana,
W79-01512 7

MCLAUGHLIN, D. B.
Design of Field Experiments to Determine th
Ecological Effects of Petroleum in Intertid
Ecosystems,
W79-01810 5

MCNAMARA, T. M.
Microbial Activity and Crude Oil-Microbial In
teractions in Water and Sediments,
W79-01801 5

MEDIONI, A. F.
Filter-Feeding Ethology of Benthic Inverte
brates (Ascidians). V. Influence of Temperatur
on Pumping, Filtration, and Digestion Rates an
Rhythms in Phallusia Mamillata,
W79-01653 5

MEGLEN, R. R.
Possible Trace Metal Mobilization of Selecte
Trace Elements from Oil-Impacted Sediment
W79-01807 5

MEINERS, A. F.
State of the Art Report on Pesticide Disposa
Research,
W79-01764 5

MELTON, B. K.
Navigation Conditions, Suck Bend Reach, Cha
tahoochee River, Alabama and Georgia; Hy
draulic Model Investigation,
W79-01664 8

MENZEL, D. W.
Controlled Ecosystem Pollution Experimen
Effect of Mercury on Enclosed Water Column
VIII. Summary of Results,
W79-01691 5

MERLI, V.
Collapsible and Expansible Barrage,
W79-01869 8

Manoeuverable Weir,
W79-01870 8

MERRY, C. J.
Environmental Analyses in the Kootenai Rive
Region, Montana,
W79-01512 7

MESROBIAN, A. L.
The Spread of Several Introduced or Recentl
Invading Aquatic in Western Massachusetts,
W79-01744 5

MIJATOVIC, B.
Current Problems in the Rational Exploitation
Karst Water,
W79-01958 2

MILAM, E. E.
Model Aids Managerial Effectiveness in Munic
pal Water Systems,
W79-01741 5

ES, P.
eatment of Aqueous Systems,
9-01887 8G

LER, E. F.
tionalization and Environmental Problems of
mhouse Operations,
9-01778 5D

LER, J. S.
sible Trace Metal Mobilization of Selected
ce Elements from Oil-Impacted Sediments,
9-01807 5C

LER, R. H.
ne Factors Affecting Denitrification in Soils
gated with Wastewater,
9-01729 5E

CKLEY, C. O.
mmer Distribution and Reproductive Status
Fish of the Colorado River in Grand Canyon
ional Park and Vicinity, 1975,
9-01585 6B

ER, G. S.
rogen Release Characteristics of Isobutyli-
e Diurea and its Effectiveness as a Source of
or Flue-Cured Tobacco,
9-01841 3F

ZONI, A. A.
the Excitation of Edge Waves on Beaches,
9-01914 2L

UK, V. A.
ermal Pollution' of Bodies of Water and the
drologic Aspects of the Problem,
9-01505 5B

HELL, J. K.
act of Offshore Oil and Gas Development
the Coastal Zone: Reforming the Impact
essment Process,
9-01783 6G

HELL, W. H.
ct of Soil Mixtures and Irrigation Methods
Leaching of N in Golf Greens,
9-01777 5B

T. W.
elopment of Technique for Detection of
Molecular Weight Contaminant in Product
er from Water Purification or Water Reuse
ems,
9-01578 5A

ERG, E. L.
ct of Fertilization on Penncross Creeping
grass,
-01754 3F

TVINA, V. P.
rmal Pollution' of Bodies of Water and the
rologic Aspects of the Problem,
-01505 5B

GOMERY, H. B.
tic Institutional Conflicts and Opportunities,
-01935 6E

IE, P.
Outlook for Progress and Technological
ods in a Paper Industry Confronted with
ronmental Problems,
-01623 5D

Y, C. D.
ward Osmosis Extractors: Theory, Feasibil-
nd Design Optimization,
-01592 3A

MOORE, D. G.
Inventory of Wetland Habitat using Remote Sensing for the Proposed OAHE Irrigation Unit in Eastern North Dakota
W79-01636 3F

MOORE, S. F.
Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

MOORE, W.
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

MOREHART, A. L.
Effect of Soil Mixtures and Irrigation Methods on Leaching of N in Golf Greens,
W79-01777 5B

MORGAN-JONES, G.
Mycoflora of Activated Sewage Sludge,
W79-01548 5E

MORITA, R. Y.
Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

MORRISON, S.
Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

MUELLER, J. C.
Toxicity Removed by Foam Separation,
W79-01770 5D

MULLER, A.
Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

MUMPHREY, A. J. JR.
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

MUNTZ, D. C.
Spill Containment and Effluent Management Program at the Hopewell Mill, Continental Forest Industries, The Continental Group, Inc.,
W79-01614 5D

MURPHY, C. B. JR.
The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

MURTHY, V. R. K.
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

MYTNY, F.
Potential for an Improved Return on Investment in the Production of Wood Fiberboard Using the Wet Process (Moznosti zvysenia efektivnosti vyroby drevovlaknitych dosak mokrym sposobom),
W79-01595 5D

NAGABHUSHANAM, R.
Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard),
W79-01700 5C

NAYFEH, A. H.
Simulation of Fluid-Rock Interactions in a Geothermal Basin,
W79-01516 2F

NEAFUS, N. J.
Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

NEEDHAM, R. N.
A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

NELSON, J. D.
Reclamation of Polluted Farm Ponds,
W79-01988 5G

NELSON, K. L.
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

NELSON, R. W.
Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

NELSON, W. L.
A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

NEY, J. J.
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

NG, K. S.
Toxicity Removed by Foam Separation,
W79-01770 5D

NG, S.
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

NICHOLAS, W. L.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

NIELSEN, N. E.
Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

NIR, A.
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

NOMURA, T.
Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

OGDEN, A. E.
Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

OLDHAM, G. F.
Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

OLLA, B. L.
The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5C

OLSEN, C. R.
Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

OSBORN, J.
Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

OSREDKAR, R.
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

OUSKO-OBERHOFFER, U.
Austrian National Report on Non-Waste Technology,
W79-01621 3E

OZORAY, G.
Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

PALM, D. J.
Engineering Studies for a Contract for Field Investigation of High Water Damage in Oswego County, New York, Appendix IV,
W79-01532 4A

PALMQUIST, R. C.
Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2F

PANDAY, V.
Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

PAPENDICK, R. I.
An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

PARKER, P. E.
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

PARNELL, J. F.
A Comparison of Plant Succession and Bird Utilization on Diked and Undiked Dredged Material Islands in North Carolina Estuaries,
W79-01659 5C

PATRICK, W. H. JR.
Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

PATTEN, L. R.
Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

PATTEN, S. M. JR.
Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

PAUL, D. M.
Method and Means of Treating Water Wells,
W79-01871 3B

PAULSON, A. C.
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

PELTIER, W.
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

PERRY, E. B.
State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

PETERSON, D.
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

PETERSON, G.
Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

PETRUSAK, F.
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

PETTY, J. A.
The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

PHILIPSON, W. R.
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

PICKERING, J. A.
An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes,
W79-01904 5G

PIIPARINEN, L.
Submersible Pumps are Proven in Effluent System at Newton Falls (New York),
W79-01603 5D

PIRIE, R. G.
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

PLUMB, J. A.
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

POLCYN, F. C.
Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

PORSCHMANN, F.
Use in the Brick Industry of Highly Discolored Fibers Recovered from the Final Effluent Clarifier of a Paper Mill (Verwertung von stark v
faerbtem Fangstoff aus der Rest-abwasserkla
anlage einer Papierfabrik in der Ziegelindustri
W79-01607

POSKITT, F. F.
Air-Regulated Siphon Spillways at Spelga Da
W79-01925

POWER, J. F.
Forage Yield and Fertilizer Recovery by Thr
Irrigated Perennial Grasses as Affected by
Fertilization,
W79-01885

Sunflower Yield and Water Use as Influenced
Planting Date, Population, and Row Spaci
W79-01999

PRENDERGAST, J.
A Study of Articulated Concrete Revetm
Mattress: Test and Analysis--Results of FY 19
Program,
W79-01513

PRESTON, R. D.
Occurrence and Quality of Ground Water
Baylor County, Texas,
W79-01929

PRICE, M.
The Use of Inclined Boreholes for Well Dev
opment,
W79-01503

PRICE, V.
Geochemical Interpretation of Kings Mounta
North Carolina, Orientation Area,
W79-01912

PRINCE, D.
How to Insure a Good Bridge Plug Job,
W79-01549

PRITCHETT, J. W.
Simulation of Fluid-Rock Interactions in a G
thermal Basin,
W79-01516

PROCTOR, P. D.
Heavy Metal Additions to Waters of the Jop
Area, Tri-State Mining District, Missouri,
W79-01969

QUATTROCHI, D.
The Verification of LANDSAT Data in
Geographical Analysis of Wetlands in W
Tennessee,
W79-01639

QUINLAN, J. F.
Review of the Physical Hydrology of the C
tral Kentucky Karst,
W79-01938

RAJO RAO, K. N.
A Manual for Hydrologic Time Series Dea
sonalization and Serial Dependence Reducti
W79-01989

RAMIG, R. E.
Root-Sink Descriptions of Water Supply to D
land Wheat,
W79-01732

RAMIREZ, J. M.
Alfalfa Water Use and Production on Dryla
and Irrigated Sandy Loam,
W79-01715

RANDAZZO, A. F.
Dolomitization in the Floridan Aquifer,
W79-01749

APP, J. R.
Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

APSON, W. H.
Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

ARIDON, R. J.
Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure,
W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies,
W79-01947 2A

AST, W.
Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

AUCH, H. W.
Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

AY, L. L.
Citric Acid Enhancement of Copper Sulfate Toxicity to Blue-Green Algae and Other Nuisance Organisms,
W79-01906 5C

BODDY, K. R.
Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

BRED, S. A.
Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

BREVE, D. W.
Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

BGER, J. P.
Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

BHDER, J.
The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

BHFIELD, E.
Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information,
W79-01978 5D

BIS, R.
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

BISER, C. O.
Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

REISH, D. J.
Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

REITZ, H. M.
Construction Methods which Recognize the Mechanics of Sinkhole Development,
W79-01974 8G

RESIO, D. T.
Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

REYNOLDS, R. C.
Major Element Geochemistry of Lake Powell,
W79-01511 2H

RHO, J.
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

RICE, S. D.
Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

RICHARDSON, N.
Treatment of Aqueous Systems,
W79-01887 8G

RICHEY, E. P.
Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

RICKMAN, R. W.
Root-Sink Descriptions of Water Supply to Dryland Wheat,
W79-01732 3F

RIDGWAY, H. C.
Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

RIEMANN, U.
Livestock Farming and Environmental Protection, (In German),
W79-01605 5D

RITCEY, G. M.
Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams,
W79-01768 5D

ROBERTSON, W. K.
Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

ROBU, I. V.
Examination of the Problem of Recuperative Treatment of Waste Water in the Chemical Industry (Consideratii Asupra Problemei Epurari Recuperative A Apelor Reziduale),
W79-01579 5D

RODEL, K.
Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

ROELS, O. A.
Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

ROESIJADI, G.
Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

ROGERS, D. E.
Determination and Description of Knowledge of the Distribution, Abundance, and Timing of Salmonids in the Gulf of Alaska and Bering Sea. A Supplement,
W79-01815 5C

ROGERS, H.
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

ROGERS, J. S.
Sequencing Competitive Expansion Projects,
W79-01561 6A

ROLLER, N. E. G.
Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

Remote Sensing of Wetlands,
W79-01642 7B

RONHOLT, L. L.
Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 2,
W79-01820 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 3,
W79-01821 5C

ROSCIO, H. A. DEL
Technical-Economical Solution to the Problem of Effluents in an Integrated Paper Mill (Solucion tecnico-economica del problema del efluente en una plant papelera integrada en operacion),
W79-01593 5D

ROSE, J. R.
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

ROSENBERG, N. J.
Application of Remote Sensing in Estimating Evapotranspiration in the Platte River Basin,
W79-01521 7B

ROTHENBACHER, H.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

ROVIN, B. E.
Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

ROWE, D. .
Review of the Physical Hydrology of the Central Kentucky Karst,
W79-01938 2F

ROWE, K.
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

RUANE, R. J.
Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants,
W79-01674 5C

RUGH, J. L. II.
Municipal Water Supply System,
W79-01863 3A

RUHE, R. V.
Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

RUHOFF, T. J.
Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

RUSSELL, J.
Method for Adenosine 5'-Triphosphate Measurement on Coke Waste Activated Sludge,
W79-01723 5D

RUSSELL, W. J.
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

RYAN, J.
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

RYASON, P. R.
Solar Photolysis of Water,
W79-01883 2K

RYGGLES, R. L.
Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

SAGE, W. W.
Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01750 5C

SALEEM, Z. A.
Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

SAMSON, F. B.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

SAN VALENTIN, G. O.
Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

SATOH, Y.
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

SAYEGH, A. H.
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

SCHACHTE, J. H.
Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

SCHAREN, H.
Development of Technique for Detection of Low Molecular Weight Contaminant in Product Water from Water Purification or Water Reuse Systems,
W79-01578 5A

SCHERER, C. R.
Investment Planning for Colorado River Salinity Control,
W79-01587 5G

SCHILLER, S.
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

SCHREINER, J. M.
Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

SCHROEDER, P. R.
Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

SCHWAB, H.
Process for Detoxification of Formaldehyde Containing Waste Waters,
W79-01876 5D

SCOTT, C. D.
Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

SCOTT, R. M.
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

SEEGERT, G. L.
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

SELF, R. W.
Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612 5D

SELIM, H. M.
Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

SELLERS, J. H.
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

SENDLEIN, L. V. A.
Model Analysis of Closed Systems in Karstic Aquifers,
W79-01952 2F

SEPASKHAH, A. R.
Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

SETTERGREN, C. D.
Early Conflicts Over Effluent Irrigation in Missouri's Ozarks,
W79-01971 6E

Subsurface Water Behavior and Sewage Ef
ent Irrigation in the Missouri Ozarks,
W79-01972

SHAHROKHI, F.
Application of LANDSAT Image Wetl
Study and Land Classification in West Tenn
see,
W79-01638

SHALHEVET, J.
Crop Water Requirement in Relation to Clim
and Soil,
W79-01712

SHANNON, M. C.
Testing Salt Tolerance Variability Among T
Wheatgrass Lines,
W79-01879

SHARON, S.
Simulation of Nitrogen Processes in Soils
Estimating Fertilizer Requirements,
W79-01713

SHAW, S. P.
Wetlands of the United States: Their Extent
Their Value to Waterfowl and Other Wildl
W79-01635

SHIBATA, K.
Decoloring of Water-Soluble Azo Dyes
Ozone (In Japanese),
W79-01599

SHIMIZU, Y.
Interaction of Chlorine and Organic Molecul
Effects of Inorganics,
W79-01903

SHIONO, H.
Adsorbent Process for Oily Materials,
W79-01864

SHIPPEN, H. H.
Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unim
Pass 1948 - 1976. A Historical Review. Volu
1,
W79-01819

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unim
Pass 1948 - 1976. A Historical Review. Volu
2,
W79-01820

Demersal Fish and Shellfish Resources of
Gulf of Alaska from Cape Spencer to Unim
Pass 1948 - 1976. A Historical Review. Volu
3,
W79-01821

SHIREMAN, J. V.
A Biological Assessment of Fish and Bentl
Populations Inhabiting a Kraft Mill Efflu
Channel,
W79-01774

SHOULTS, M.
Study of Water Treatment Effects on Orga
Volatiles in Drinking Water,
W79-01722

SHUMAN, R.
UV-Ozone Water Oxidation/Sterilization Pro
ess,
W79-01581

SHUTTLEWORTH, S. G.
The Evolution of Tannery Effluent Treatmen
Guidelines for Further Investigations,
W79-01780

IEVERS, R. E.
Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments, W79-01807 5C

IGNOR, D. C.
Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico, W79-01992 4B

IMPSON, H. J.
Sources of Heavy Metals in Sediments of the Hudson River Estuary, W79-01678 5B

INCLAIR, C. B.
A Preliminary Ecological Survey of Dardanelle Reservoir Prior to Nuclear Facility Effluent Discharge, W79-01591 6G

LATER, M. J.
Use of Continuous Ion Exchange for Removal of Environmental Contaminants from Waste Streams, W79-01768 5D

LATER, S. J. E.
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria, W79-01697 5C

LOCOVICH, S. E.
Water Resources Planning for Rivers Draining into Mobile Bay, W79-01510 4A

MART, D. R.
Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains, W79-01797 5C

MECK, N. E.
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio, W79-01926 2J

MITH, G. J.
Geothermal Power and Water Production Studies at the University of California, W79-01546 3E

MITH, G. P.
Geophysical Investigations Over Karst Water in Southeastern Missouri, W79-01942 2F

MITH, J. M.
Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores, W79-01572 5D

Mass Transfer in Packed Beds with Two-Phase Flow, W79-01567 2K

Trickle-Bed Reactor Performance, Part II: Reaction Studies, W79-01566 5D

Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects, W79-01565 5D

MITH, M. J.
Treatment of Aqueous Systems, W79-01887 8G

MITH, R. L.
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea, W79-01813 5C

SNIDER, H. I.
Analysis of Current Land-Use and Zoning Versus Selected Environmental Factors in Drainage Basins Containing Lakes or Ponds, W79-01589 2H

SNODGRASS, R. W.
The Roles of Water Conservation Values in Community Policy, W79-01987 3D

SNYDER, C. B.
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects, W79-01667 5C

SNYDER, E. R.
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains, W79-01940 2F

SOLOMON, K.
An Introduction to Emission Uniformity, W79-01686 8B

SOMERO, G. N.
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects, W79-01667 5C

SPEARS, R. W.
Trickle Emitter for Subterranean Irrigation, W79-01860 3F

SPEARS, W. D.
An Unobtrusive Measure of the Recreational Value of a Lake, W79-01986 6B

SPOSITO, G.
The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws, W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law, W79-01725 2G

SPRINGER, B. C.
Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama, W79-01956 2F

SPYRIDAKIS, D. E.
Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage, W79-01985 5B

STACH, R. L.
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota, W79-01897 5A

STANLEY, J.
Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments, W79-01807 5C

STEARNS, F.
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species, W79-01555 6G

STEARNS, R. P.
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses, W79-01660 5B

STEFANO, G. B.
The Effects of Short and Long Term Temperature Stress on Serotonin, Dopamine and Norepinephrine Concentrations in Molluscan Ganglia, W79-01684 5C

STERLINI, J.
Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide), W79-01596 5D

STERN, D. H.
Citric Acid Enhancement of Copper Sulfate Toxicity to Blue-Green Algae and Other Nuisance Organisms, W79-01906 5C

STERN, E. M.
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review, W79-01656 5C

STERN, M. S.
Citric Acid Enhancement of Copper Sulfate Toxicity to Blue-Green Algae and Other Nuisance Organisms, W79-01906 5C

STEVEN, S. E.
Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments, W79-01801 5C

STICKEL, F. V.
Geothermal Power and Water Production Studies at the University of California, W79-01546 3E

STICKLE, W. B.
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review, W79-01656 5C

STOKER, B. A.
Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII, W79-01533 4A

STRADOMSKIY, V. B.
Problems in Automating the Monitoring of Surface Water Chemistry, W79-01507 5A

STRELTSOVA, T. D.
Flow to a Well in an Unconfined Fractured Aquifer, W79-01953 2F

Storage Properties of Fractured Formations, W79-01950 2F

STRINGFIELD, V. T. AND
Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review, W79-01933 2F

STUDER, J. B.
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts, W79-01545 6B

SULLIVAN, M. J.
Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh, W79-01750 5C

SULLIVAN, M. J.

Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

SULLIVAN, T. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

SVITEL'SKII, V. P.
Disk Filters for Effluent Purification (Diskovye fil'try dlya ochistki stochnykh vod),
W79-01594 5D

SWEENEY, R. A.
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Evaluative Summary,
W79-01657 5E

TAKAMATSU, T.
Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

TAKASE, Y.
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

TANNER, G.
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

TATE, T. K.
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

TAYLOR, S. L.
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

TENNYSON, L. C.
Subsurface Water Behavior and Sewage Effluent Irrigation in the Missouri Ozarks,
W79-01972 5B

TERJUNG, W. H.
Solar Radiation and Urban Heat Islands,
W79-01568 2B

TERMAN, G. L.
Nutrient Uptake by Grass and Leaching Losses from Soluble and S-Coated Urea and KCl,
W79-01705 3F

TERRY, D. L.
Nitrogen Release Characteristics of Isobutylidene Diurea and its Effectiveness as a Source of N for Flue-Cured Tobacco,
W79-01841 3F

TESMER, M.
Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

THOMAS, A. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01924 7B

THOMAS, J. C.
Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

THOMAS, J. F.
Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

THOMAS, L. C.
The NOAA National Analytical Facility -- A Status Report,
W79-01806 5C

THOMASON, M.
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

THOMSON, G.
A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

THORNTON, I.
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

TILSWORTH, T.
Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

TIPSEV, A. YA.
Disk Filters for Effluent Purification (Diskovye fil'try dlya ochistki stochnykh vod),
W79-01594 5D

TIPTON, M. J.
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

TLEIMAT, B. W.
Geothermal Power and Water Production Studies at the University of California,
W79-01546 3E

TOMAS, C. R.
Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival,
W79-01682 5C

TOUCHTON, J. T.
Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

TRAULSEN, V. H.
Utilization and Disposal of Liquid Manure at Small Available Space, (In German),
W79-01640 5E

TSANG, H. H.
Management of Local Water Systems in Alabama,
W79-01536 6E

TSIPPERT, M. R.
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

TUCKER, C. S.
Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5C

TURNER, T. R.
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

TURNER, W. M.
Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

TYCHSEN, P. C.
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

UEBAYASHI, T.
Adsorbent Process for Oily Materials,
W79-01864 5G

URATSUJI, T.
Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

VALKENBURG, N.
Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

VALORAS, N.
Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

VAN VOAST, W. A.
Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

VARANASI, U.
Biological Fate of Metals in Fish,
W79-01792 5C

VERNBERG, F. J.
The Influence of Constant and Cyclic Acclimation Temperatures on the Metabolic Rates of Panopeus Herbstii and Uca Pugilator,
W79-01685 5C

VERNICK, A. S.
How to Conduct a Wastewater Survey: Part II - Developing Waste Stream Profiles,
W79-01760 5G

VETTENRANTA, I.
Biological Method for Purifying Kraft Pulp Mill Condensates,
W79-01626 5D

VIELKIND, D.
Mathematical Models of Dissolved Oxygen Concentration in Fresh Water,
W79-01998 5C

VILLAVASO, S. D.
Louisiana Metropolitan Wetlands: A Planning Perspective, A Report to the Louisiana State Planning Office,
W79-01650 6B

VINCENT, C. L.
Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

WABERS, B. A.
Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

WADDINGTON, D. V.
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

WALL, G. J.
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

LLACE, D. E.
artial Area Response on Small Semiarid Water-
eds,
79-01916 2E

LLING, D. E.
he 1976 Drought and Nitrate Levels in the
iver Exe Basin,
79-01504 5B

LSH, L. M.
ffectiveness of Nitrapyrin in Controlling Nitri-
cation of Fall and Spring-Applied Anhydrous
mmonia,
79-01849 3F

valuation of Nitrapyrin as a Means of Improv-
g N Efficiency in Irrigated Sands,
79-01847 3F

nproved Techniques for Marking and Sam-
ing Band-Applied Fertilizers and Pesticides,
79-01709 5A

LSKI, T. M.
eir Design to Maintain Effluent Quality from
redged Material Containment Areas,
79-01655 5G

NDESFORDE-SMITH, G.
he Study of Environmental Public Policy: A
reliminary Directory,
79-01569 6B

NG, L. K.
athematical Models of Dissolved Oxygen
oncentration in Fresh Water,
79-01998 5C

NG, M. H.
athematical Models of Dissolved Oxygen
oncentration in Fresh Water,
79-01998 5C

RDWELL, R. E.
pplication of Geotechnical Theories to the
andfill Disposal of Papermill Sludges,
79-01620 5E

RK, J.
V-Ozone Water Oxidation/Sterilization Proc-
s,
79-01581 5D

RNER, J. S.
ctivity-Directed Fractionation of Petroleum,
79-01799 5C

RRICK, A. W.
inearized Moisture Flow with Loss at the Soil
rface,
79-01704 2G

TSON, R. L.
Preliminary Ecological Survey of Dardanelle
eservoir Prior to Nuclear Facility Effluent
ischarge,
79-01591 6G

BB, B. C.
Land Study for Downtown Lake Charles,
79-01838 6B

BB, J. S.
pplication in the Water Industry of Regional
eochemical Maps of England and Wales,
79-01501 5B

BER, D. D.
ublethal Effects of Petroleum Hydrocarbons
d Trace Metals Including Biotransformations,
Reflected by Morphological, Physiological,
thological, and Behavioral Indices,
79-01791 5C

WEDDERBURN, L. A.
Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

WEEKS, W. W.
Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

WEGMULLER, H.
Process for the Purification of Industrial Effluents,
W79-01874 5D

WEILER, R. R.
Exchange of Carbon Dioxide Between the Atmosphere and Lake Ontario,
W79-01550 2K

WEIN, G. M.
Method for Treating Aqueous Wastes Containing at Least 1% Proteinaceous Matter,
W79-01875 5D

WELCH, L. F.
Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

WELCH, P. H.
Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

WENDTE, L. W.
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

WERNER, E.
Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

WEST, D. W.
Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

WESTERGAARD, J. M.
Bdellovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

WHIPPLE, J. A.
Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

WHIPPLE, W. JR.
Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

The West Branch Shabakunk Creek: A Surveillance Report of Physical Conditions and Biological Health,
W79-01543 5C

WHITE, J. P.
Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6E

WHITE, W. B.
Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2F

WHITED, D. A.
Management of Irrigated Soybeans on a Moderately Coarse-Textured Soil in the Upper Midwest,
W79-01775 3F

WHITLEY, L. D.
Karst Topography and Its Occurrence in Kentucky,
W79-01937 2F

WHITMAN, G. B.
On the Excitation of Edge Waves on Beaches,
W79-01914 2L

WIENS, J. A.
Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

WILDING, L. P.
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

WILEY, A. J.
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

WILKINSON, R. R.
State of the Art Report on Pesticide Disposal Research,
W79-01764 5E

WILLAVIZE, S.
Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

WILLIAMS, D. C. JR.
Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

WILLIAMS, P. W.
Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

WILLIAMS, S. C.
Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

WILSON, J. V.
Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

WINKLER, E.
Measurement of Total Organic Concentration in Water,
W79-01600 5A

WITTERS, R. E.
Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

WOLFE, D. A.
Marine Biological Effects of OCS Petroleum Development,
W79-01788 5C

OCSEAP: An Overview and a Context for Studies on Biological Effects,
W79-01789 5C

An Overview of NOAA's Energy Resources Project on Fate and Effects of Contaminants in Marine Ecosystems and Organisms,
W79-01805 5C

WOOD, D. H.
Temperature Adaptation in the Freshwater Snail, Helisoma Trivolvis (Say),, in an Artificially Heated Reservoir in the Southeastern United States,
W79-01681 5C

WOOD, W. W.
Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

WOODRUFF, J. M.
Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

WORLEY, D. E.
The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

WRIGHT, D. L.
Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

YAMAGOSHI, M.
Studies of Flocculation and Sedimentation Treatment of Pulp Mill Effluent (Part 3) - Recovery and Reuse of Alum Sludge (Parupu haisui gyoshu shoriho no kenkyu (daisanpo) - ryusan aruminyumu shori suraji no kurozu ka shori),
W79-01758 5E

YANCEY, P. H.
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

YARBOROUGH, K. A.
Alpha Radiation Monitoring of National Park Service Administered Caves in United States,
W79-01943 2F

YERMANOS, D. M.
Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

YOCOM, T. G.
Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil in Experimental Food Chains,
W79-01797 5C

YOSHIDA, H.
Recovering System for Chrome-Plating Wastewater Containing Chromic Acid (Kuromu mekki haisui no shori shisutemu),
W79-01767 5D

YOSHIDA, T.
Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

YOUNG, R. W.
Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

ZABAWA, C. F.
Microstructure of Agglomerated Suspended Sediments in Northern Chesapeake Bay Estuary,
W79-01923 2L

ZAIR-BEK, I. A.
'Thermal Pollution' of Bodies of Water and the Hydrologic Aspects of the Problem,
W79-01505 5B

ZANELLA, E.
Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

ZAVALETA, L.
The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

ZEFF, J. D.
UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

ZENNO, A.
Adsorbent Process for Oily Materials,
W79-01864 5G

ZIMMERMAN, D. C.
Sunflower Yield and Water Use as Influenced by Planting Date, Population, and Row Spacing,
W79-01999 3F

ZOTL, J. G.
Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

ZWINGELSTEIN, G.
Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

ZYVOLOSKI, G.
Finite Element Solution of Two-Dimensional Unsteady and Unsaturated Flow in Porous Media.
W79-01560 2G

A Finite Element Solution to a General Two-Dimensional Nonsymmetric Parabolic Partial Differential Equation,
W79-01559 2G

A Finite Element Weighted Residual Solution to One-Dimensional Field Problems,
W79-01558 2G

ORGANIZATIONAL INDEX

ABT ASSOCIATES INC., CAMBRIDGE, MA.
Incentives for Improved Water-Use Efficiency: Implementation Phase,
W79-01836 3F

AG WATER, SHAFTER, CA.
Mainline Installation,
W79-01689 3F

AGRICULTURAL RESEACH SERVICE, RIVERSIDE, CA. SALINITY LAB.
Testing Salt Tolerance Variability Among Tall Wheatgrass Lines,
W79-01879 3C

AGRICULTURAL RESEARCH SERVICE, BOISE, ID. NORTHWEST WATER RESEARCH CENTER.
Forage Yield and Fertilizer Recovery by Three Irrigated Perennial Grasses as Affected by N Fertilization,
W79-01885 3F

AGRICULTURAL RESEARCH SERVICE, MANDAN, ND. NORTHERN GREAT PLAINS RESEARCH CENTER.
Sunflower Yield and Water Use as Influenced by Planting Date, Population, and Row Spacing,
W79-01999 3F

AGRICULTURAL RESEARCH SERVICE, STONEVILLE, MS.
Assembly for Mounting Hydraulic Soil Core Sampler on Tractor Front,
W79-01710 7B

AGRICULTURAL RESEARCH SERVICE, TUCSON, AZ. SOUTHWEST WATERSHED RESEARCH CENTER.
Partial Area Response on Small Semiarid Watersheds,
W79-01916 2E

AGRICULTURE RESEARCH SERVICE, PENDLETON, OR. COLUMBIA PALTEAU CONSERVATION RESEARCH CENTER.
Root-Sink Descriptions of Water Supply to Dryland Wheat,
W79-01732 3F

AIR FORCE CIVIL ENGINEERING CENTER, KIRTLAND AFB, NM.
The Adsorption of Chromium (VI) at the Oxide/Water Interface,
W79-01514 5B

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
Refinery Cyanides: A Regulatory Dilemma,
W79-01763 5D

AKTIEBOLAGET ATOMENERGI, STOCKHOLM (SWEDEN). (ASSIGNEE).
Hot Water Reservoir,
W79-01862 8C

ALABAMA UNIV. IN BIRMINGHAM, DEPT. OF BIOLOGY.
Method for Adenosine 5'-Triphosphate Measurement on Coke Waste Activated Sludge,
W79-01723 5D

ALABAMA UNIV. IN EIRMINGHAM. DEPT. OF POLITICAL SCIENCE.
Management of Local Water Systems in Alabama,
W79-01536 6E

ALABAMA UNIV., UNIVERSITY. DEPT. OF CHEMICAL AND METALLURGICAL ENGINEERING.
Water Resources Planning for Rivers Draining into Mobile Bay,
W79-01510 4A

ALABAMA UNIV., UNIVERSITY. DEPT. OF CHEMISTRY.
Study of Water Treatment Effects on Organic Volatiles in Drinking Water,
W79-01722 5F

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W79-01813 5C

Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton,
W79-01816 5C

Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chukchi Sea, and Kotzebue Sound,
W79-01817 5C

ALASKA UNIV., FAIRBANKS. INST. OF WATER RESOURCES.
Effects of Thermal Discharge Upon a Subarctic Stream,
W79-01898 5B

Hydrologic Interpretation of Basin Morphology,
W79-01899 2A

Environmental Planning for an Alaskan Water-Oriented Recreational Area,
W79-01900 5C

Flood Frequency Design in Sparse-Data Regions,
W79-01901 4A

North Slope Borough Water Study, A Background for Planning,
W79-01991 5D

AMERADA HESS CORP., WOODBRIDGE, NJ. (ASSIGNEE).
Hydro-Carpet Oil Spillage Containment and Recovery Device,
W79-01866 5G

AMERICAN UNIV., BEIRUT (LEBANON). DEPT. OF SOILS AND IRRIGATION.
Factors Affecting Gypsum and Cation Exchange Capacity Determinations in Gypsiferous Soils,
W79-01716 2K

AMERICAN WATER WORKS ASSOCIATION RESEARCH FOUNDATION, DENVER, CO.
Water Reuse Highlights, A Summary Volume of Wastewater Reclamation and Reuse Information,
W79-01978 5D

AMICON CORP., LEXINGTON, MA.
Development of Technique for Detection of Low Molecular Weight Contaminant in Product Water from Water Purification or Water Reuse Systems,
W79-01578 5A

APPALACHIAN REGIONAL COMMISSION, WASHINGTON, DC. ENERGY, ENVIRONMENT AND NATURAL RESOURCES DIV.
Karstic Institutional Conflicts and Opportunities,
W79-01935 6E

ARIZONA STATE UNIV., TEMPE. DEPT. OF CHEMICAL ENGINEERING.
Development and Evaluation of Improved Films for Suppressing Water Evaporation,
W79-01537 3B

ARIZONA UNIV., TUCSON. DEPT. OF PLANT SCIENCES.
Effects of Cultural Practices on Grain Yield of Irrigated Wheat,
W79-01761 3F

ARIZONA UNIV. TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
Linearized Moisture Flow with Loss at the Soil Surface,
W79-01704 2G

ARIZONA UNIV., TUCSON. DEPT. OF SYSTEMS AND INDUSTRIAL ENGINEERING; ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES; AND ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Decision Making in a Multiple-Use Approach to the Reclamation of Strip-Mined Lands,
W79-01730 5G

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Forward Osmosis Extractors: Theory, Feasibility and Design Optimization,
W79-01592 3A

ARKANSAS WATER RESOURCES RESEARCH CENTER, FAYETTEVILLE.
A Preliminary Ecological Survey of Dardanelle Reservoir Prior to Nuclear Facility Effluent Discharge,
W79-01591 6G

ARMY DUGWAY PROVING GROUND, UT.
Bacterial Aerosols from Cooling Towers,
W79-01694 5C

ARMY ENGINEER DISTRICT, BALTIMORE, MD.
Cost Report on Non-Structural Flood Damage Reduction Measures for Residential Buildings within the Baltimore District,
W79-01832 6F

Flood Plain Information: Frankstown Branch, Juniata River, Claysburg, Pennsylvania.
W79-01853 4A

Flood Plain Information: Muddy Branch, Montgomery County Maryland.
W79-01854 4A

ARMY ENGINEER DISTRICT FORT WORTH, TX.
Flood Plain Information: Salt Creek and Tributaries, Olney, Texas.
W79-01852 4A

ARMY ENGINEER DISTRICT, GALVESTON, TX.
Flood Plain Information: Panther and Bear Branches, Montgomery County, Texas.
W79-01859 4A

ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, in, Vol. I: Report.
W79-01827 6B

ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL, and Clifty Creek and Patoka River, IN. Vol. II: Appendices A-C.
W79-01828 6B

Interim Report No. 2, Wabash River Basin Comprehensive Study Covering Reservoir Sites on Embarrass River, IL., and Clifty Creek and Patoka River, IN. Vol. III, Appendices D-F.
W79-01829 6B

ARMY ENGINEER DISTRICT, PITTSBURGH, PA.

Flood Plain Information: Pigeon Creek, Bentleyville, Fallowfield Township and Somerset Township, Pennsylvania.
W79-01850 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CA.

Flood Hazard Information: Clover Creek, Stillwater Creek and Stillwater Creek Tributaries, Loomis Corners, California.
W79-01851 4A

Flood Hazard Information: Sacramento River and Cottonwood and Battle Creeks, Cottonwood-Bend Area, California.
W79-01855 4A

Flood Plain Information: Provo River and Slate Canyon Creek, Provo, Utah.
W79-01857 4A

ARMY ENGINEER DISTRICT, TULSA, OK.

Flood Plain Information: Bird Creek and Tributaries, Pawhuska, Oklahoma.
W79-01856 4A

Flood Plain Information: Coal Creek and Tributaries, Henryetta, Oklahoma.
W79-01858 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.

Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas,
W79-01655 5G

Numerical Simulation of Tidal Hydrodynamics, Great Egg Harbor and Corson Inlets, New Jersey,
W79-01661 2L

Design Wave Information for the Great Lakes; Report 5, Lake Superior,
W79-01662 8B

Indian Creek Pumping Station, Mankato, Minnesota; Hydraulic Model Investigation,
W79-01663 8C

Navigation Conditions, Suck Bend Reach, Chattahoochee River, Alabama and Georgia; Hydraulic Model Investigation,
W79-01664 8B

Preliminary Guide to Wetlands of the West Coast States; Major Associations and Communities Identified.
W79-01665 2I

Preliminary Evaluation of the Water Quality of Proposed Towanda Lake, Kansas.
W79-01666 5A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. ENVIRONMENTAL EFFECTS LAB.

Pregermination Requirements and Establishment Techniques for Salt Marsh Plants,
W79-01641 2I

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. HYDRAULICS LAB.

Effects of Construction of Liberty State Park on Hydraulic Characteristics of New York Harbor; Hydraulic Model Investigation,
W79-01518 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. SOILS AND PAVEMENTS LAB.

State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity,
W79-01520 8D

ARMY FACILITIES ENGINEERING SUPPORT AGENCY, FORT BELVOIR, VA. RESEARCH AND TECHNOLOGY DIV.

Feasibility of Recycling Laundry Wastewaters at Military Quartermaster Laundries,
W79-01574 5D

ARMY TERRESTRIAL SCIENCES CENTER, HANOVER, NH.

Environmental Analyses in the Kootenai River Region, Montana,
W79-01512 7B

ARROWHEAD REGIONAL DEVELOPMENT COMMISSION, DULUTH, MN.

Great Lakes Shoreline Damage Survey, Saint Louis County, Minnesota, Appendix I.
W79-01529 4A

ASSOCIATION FOR THE PRESERVATION OF CAPE COD, ORLEANS, MA.

Survey of Orders of Conditions (Under Wetlands Protection Act) of the Conservation Commissions of Cape Cod, 1973-1977.
W79-01631 6E

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WA.

Conceptual and Mathematical Modeling of the Hanford Groundwater Flow Regime,
W79-01522 5B

AUBURN UNIV., AL.

Fungal Degradation of Anaerobically Digested Sewage Sludge,
W79-01547 5E

AUBURN UNIV., AL. DEPT. OF CHEMICAL ENGINEERING.

Pollution Concentrations in Runoff Water from Refuse Piles,
W79-01892 5B

AUBURN UNIV., AL. DEPT. OF CIVIL ENGINEERING.

Color Removal from Textile Dye Waste Using Magnesium Carbonate,
W79-01776 5D

AUBURN UNIV., AL. DEPT. OF MICROBIOLOGY.

Bdellovibrio and the Intestinal Flora of Vertebrates,
W79-01742 5F

AUBURN UNIV., AL. INTERNATIONAL CENTER FOR AQUACULTURES.

Consequences of Periodic Applications of Copper Sulfate and Simazine for Phytoplankton Control in Catfish Ponds,
W79-01672 5C

AUBURN UNIV., AL. INTERNATIONAL CENTER FOR AQUECULTURES.

Streptococcus Sp. from Marine Fishes Along the Alabama and Northwest Florida Coast of the Gulf of Mexico,
W79-01698 5C

AUBURN UNIV., AL. WATER RESOURCES RESEARCH INST.

Mycoflora of Activated Sewage Sludge,
W79-01548 5E

Occurrence of Iron Bacteria in Ground Water Supplies of Alabama,
W79-01908 5B

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF BOTANY.

Submerged Vegetation of the Rotorua and Waikato Lakes 3. Lake Rerewhakaiitu,
W79-01652 2H

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF GEOGRAPHY.

Impact of Urbanization on the Hydrology of Wairau Creek, North Shore, Auckland,
W79-01922 2E

AUGUSTA COLL., GA.

An Unobtrusive Measure of the Recreational Value of a Lake,
W79-01986 6B

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ZOOLOGY.

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Nematocera),
W79-01696 5C

BALLISTIC RESEARCH LABS. ABERDEEN PROVING GROUND, MD.

A Gamma-Ray Counting Apparatus for Evaluating the Fallout Removal Effectiveness of Reverse-Osmosis Water Purification Systems,
W79-01576 5D

BATTELLE MEMORIAL INST. COLUMBUS, OH.

Activity-Directed Fractionation of Petroleum,
W79-01799 5C

BATTELLE PACIFIC NORTHWEST LAB., SEQUIM, WA. MARINE RESEARCH LAB.

Bioavailability of Hydrocarbons and Heavy Metals to Marine Detritivores from Oil-Impacted Sediments,
W79-01798 5C

BEN-GURION UNIV. OF THE NEGEV, BEERSHEBA (ISRAEL). INST. OF SOIL AND WATER.

Radiation and Energy Balance of Sprinkler and Trickle Irrigated Fields,
W79-01990 3F

BETHEL RESEARCH ASSOCIATION, LOUISVILLE, KY.

Evaluation of Sulfate Water Quality in the North-Central Kentucky Karst,
W79-01966 5B

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.

Storage Properties of Fractured Formations,
W79-01950 2F

BITTINGER (M. W.) AND ASSOCIATES, INC., FORT COLLINS, CO.

Snowpack Ground Truth: Radar Test Site, Steamboat Springs, Colorado, April 8-16, 1976,
W79-01527 2C

WDEN NATIONAL FISH HATCHERY,
.
The Effects of Highway Construction on the Hydrogeologic Environment at Bowden, West Virginia,
W79-01975 5B

ADFORD UNIV., (ENGLAND), SCHOOL CHEMICAL ENGINEERING.
Use of Continuous Ion Exchange for Removal f Environmental Contaminants from Waste treams,
W79-01768 5D

ITISH COLUMBIA FOREST PRODUCTS D., MACKENZIE.
Removing Toxicity in an Aerated Stabilization Basin,
W79-01772 5D

ITISH COLUMBIA RESEARCH COUNCIL, NCOUVER.
Metal Concentrations (AS, CD, CU, PB and ZN) in Shorthorn Sculpins, Myoxocephalus Scorpius (Linnaeus) and Arctic Char, Salvelinus Alpinus (Linnaeus), From the Vicinity of Strathona Sound, Northwest Territories,
W79-01552 5B

ITISH COLUMBIA RESEARCH COUNCIL, NCOUVER. DIV. OF APPLIED BIOLOGY.
Toxicity Removed by Foam Separation,
W79-01770 5D

ITISH PETROLEUM CO. LTD., LONDON NGLAND). (ASSIGNEE).
Oil-Containing Effluent Treatment by Gravity Separation,
W79-01888 5D

OCK UNIV., ST. CATHERINES NTARIO). DEPT. OF BIOLOGICAL IENCES.
Some Effects of Photoperiod, Temperature, and Food on Emergence in Three Species of Chironomidae (Diptera),
W79-01688 5C

RNS AND ROE INDUSTRIAL SERVICES RP., PARAMUS, NJ.
How to Conduct a Wastewater Survey: Part II - Developing Waste Stream Profiles,
W79-01760 5G

LIFORNIA INST. OF TECH., PASADENA. PT. OF APPLIED MATHEMATICS.
On the Excitation of Edge Waves on Beaches,
W79-01914 2L

LIFORNIA STATE UNIV., LONG BEACH. PT. OF BIOLOGY.
Studies on the Mytilus Edulis Community in Alamitos Bay, California: VII. The Influence of Water-Soluble Petroleum Hydrocarbons on Byssal Thread Formation,
W79-01701 5C

LIFORNIA UNIV. AT DAVIS, STINSON ACH. POINT REYES BIRD BSERVATORY.
Influence of Petroleum on Egg Formation and Embryonic Development in Seabirds,
W79-01802 5C

LIFORNIA UNIV., BERKELEY.
Power Plant Cooling Water Chlorination in Northern California,
W79-01676 5C

CALIFORNIA UNIV., BERKELEY. SCHOOL OF PUBLIC HEALTH.
Consumer Attitudes Toward Taste and Odor in Water,
W79-01739 6B

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
Geothermal Power and Water Production Studies at the University of California,
W79-01546 3E

CALIFORNIA UNIV., DAVIS. DEPT. O
Trickle-Bed Reactor Performance, Part II: Reaction Studies,
W79-01566 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.
Water Supplies and Costs in Relation to Farm Resource Decisions and Profits on Sacramento Valley Farms,
W79-01737 6C

CALIFORNIA UNIV., DAVIS. DEPT. OF CHEMICAL ENGINEERING.
Trickle-Bed Reactor Performance, Part 1: Holdup and Mass Transfer Effects,
W79-01565 5D

Mass Transfer in Packed Beds with Two-Phase Flow,
W79-01567 2K

Catalytic Oxidation of Formic Acid in Water. Intraparticle Diffusion in Liquid-Filled Pores,
W79-01572 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01735 5G

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER.
Combined Temperature-Salinity Effects on Grass Shrimp,
W79-01645 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
Reducing Phreatophyte Transpiration,
W79-01562 3B

A Nondestructive Approach to Reducing Riparian Transpiration,
W79-01586 3B

CALIFORNIA UNIV., DAVIS. DEPT. OF POLITICAL SCIENCE.
The Study of Environmental Public Policy: A Preliminary Directory,
W79-01569 6B

CALIFORNIA UNIV., LOS ANGELES.
On Optimal Regulation Policies for Certain Multi-Reservoir Systems,
W79-01731 4A

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF GEOGRAPHY.
Solar Radiation and Urban Heat Islands,
W79-01568 2B

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF SYSTEM SCIENCE.
Optimal Regulation Policies for a Multipurpose Reservoir with Seasonal Input and Return Function,
W79-01570 4A

CALIFORNIA UNIV., LOS ANGELES. GRADUATE SCHOOL OF MANAGEMENT.
Sequencing Competitive Expansion Projects,
W79-01561 6A

CALIFORNIA UNIV., LOS ANGELES. GRADUATE SCHOOL OF MANAGEMENT; AND CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Investment Planning for Colorado River Salinity Control,
W79-01587 5G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PLANT SCIENCES.
Analysis of Fallow-Farming Systems in Semi-Arid Africa Using a Model to Simulate the Hydrologic Budget,
W79-01785 2D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL AND ENVIRONMENTAL SCIENCES.
The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 1. The Conservation Laws,
W79-01724 2G

The Statistical Mechanical Theory of Water Transport Through Unsaturated Soil. 2. Derivation of the Buckingham-Darcy Flux Law,
W79-01725 2G

Responses of Stomata and Water, Osmotic, and Turgor Potentials of Jojoba to Water and Salt Stress,
W79-01909 3C

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Uptake and Translocation of a Nonionic Surfactant by Barley,
W79-01563 2I

Nonionic Surfactant Effects on Growth and Porosity of Barley Roots,
W79-01564 2I

The Use of Nonionic Surfactants on Soils,
W79-01571 2G

CALIFORNIA UNIV., RIVERSIDE. DIV. OF BIOLOGICAL CONTROL.
Temperature Requirements of Tilapia Zillii,
W79-01668 5C

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF BIOLOGICAL SCIENCES.
Studies on the Decomposition of Allochthonous Detritus in Two Southern California Streams,
W79-01588 5B

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF MECHANICAL AND ENVIRONMENTAL ENGINEERING.
Two-Dimensional Unsteady Water Flow in Unsaturated Porous Media,
W79-01556 2G

Transient Two-Dimensional Problems Utilizing the Least Squares Algorithm,
W79-01557 2G

A Finite Element Weighted Residual Solution to One-Dimensional Field Problems,
W79-01558 2G

A Finite Element Solution to a General Two-Dimensional Nonsymmetric Parabolic Partial Differential Equation,
W79-01559 2G

Finite Element Solution of Two-Dimensional Unsteady and Unsaturated Flow in Porous Media.
W79-01560 2G

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
The Effects of Advection-Diffusion Processes on the Eutrophication of Large Lakes, a Hypothetical Example: Lake Superior,
W79-01993 5C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO); AND NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ANN ARBOR, MI. GREAT LAKES ENVIRONMENTAL RESEARCH LAB.
Exchange of Carbon Dioxide Between the Atmosphere and Lake Ontario,
W79-01550 2K

The Effect of Temperature and Body Size on Electron Transport System Activity in Freshwater Zooplankton,
W79-01683 5C

CENTRE TECHNIQUE DE PAPIER, GRENOBLE (FRANCE).
The Outlook for Progress and Technological Methods in a Paper Industry Confronted with Environmental Problems,
W79-01623 5D

CH2M/HILL, CORVALLIS, OR. INDUSTRIAL PROCESSES DIV.
Operating Experiences at Longview Fibre Company's Pure Oxygen Activated Sludge System,
W79-01615 5D

CHESTER ENGINEERS, INC., CORAOPOLIS, PA. GEOTECHNICAL DEPT.
A Preliminary Investigation on Seismic Techniques Used to Locate Cavities in Karst Terrains,
W79-01940 2F

CIBA-GEIGY CORP., ARDSLEY, NY. (ASSIGNEE).
Process for the Purification of Industrial Effluents,
W79-01874 5D

CIBA GEIGY LTD., LONDON (ENGLAND). (ASSIGNEE).
Treatment of Aqueous Systems,
W79-01887 8G

CLEMAR MFG. CORP., GLENDORA, CA. (ASSIGNEE).
Master-Satellite Irrigation Control System with Remote Proportional Timing,
W79-01861 3F

COASTAL ENGINEERING RESEARCH CENTER, FORT BELVOIR, VA.
Hydraulics and Stability of Tidal Inlets,
W79-01519 8B

COLORADO STATE UNIV., FORT COLLINS.
The Roles of Water Conservation Values in Community Policy,
W79-01987 3D

COLORADO UNIV., BOULDER. DEPT. OF CHEMISTRY.
Possible Trace Metal Mobilization of Selected Trace Elements from Oil-Impacted Sediments,
W79-01807 5C

COMBUSTION ENGINEERING, INC., WINDSOR, CT. (ASSIGNEE).
Liquid Waste Processing System,
W79-01890 5D

COMPAGINE ELECTRO-MECANIQUE, PARIS, (FRANCE),
Process and Apparatus for Introducing Gas Bubbles into a Liquid (Procede et dispositif pour introduire des bulles gazeuses dans un liquide),
W79-01596 5D

CONNECTICUT UNIV., STORRS. DEPT. OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE.
Pattern Recognition Techniques Applied to Oil Identification,
W79-01747 5A

CONNECTICUT UNIV., STORRS. DEPT. OF STATISTICS.
A Probability Model for Matching Suspects with Spills - or Did the Real Spiller Get Away.,
W79-01748 5A

CONSERVATION FOUNDATION, WASHINGTON, DC.
Preserving the Heritage of Gasparilla Island, an Approach to Conservation of the Economic, Cultural, Historical, and Natural Resources of the Island,
W79-01646 6G

CONSOLIDATED PAPERS, INC., WHITING, WI.
Components of a Successful In-Mill Close Up Program,
W79-01613 5D

CONSTRUCTION ENGINEERING RESEARCH LAB. (ARMY), CHAMPAIGN, IL.
A Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1975 Program,
W79-01513 8F

CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, IL.
Vehicle Washing Operations and Wastewater Discharges, Fort Drum, NY -- Findings and Recommendations,
W79-01573 5D

CORNELL, HOWLAND, HAYES AND MERRYFIELD, BELLEVUE, WA.
The Upper Columbia Navigation Proposal.
W79-01843 4A

CORNELL UNIV., ITHACA, NY. CENTER FOR ENVIRONMENTAL RESEARCH.
Remote Sensing Assessment of Dam Flooding Hazards: Methodology Development for the New York State Dam Safety Program,
W79-01980 4A

CORPS OF ENGINEERS, CHICAGO, IL. NORTH CENTRAL DIV.
Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study,
W79-01528 4A

DAICEL LTD., SAKAI (JAPAN). (ASSIGNEE).
Adsorbent Process for Oily Materials,
W79-01864 5G

DAMES AND MOORE, HOMER, AK.
Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet,
W79-01824 5C

DARTMOUTH COLL., HANOVER, NH. DE OF EARTH SCIENCES.
Major Element Geochemistry of Lake Pov
W79-01511

DELAWARE UNIV., NEWARK. DEPT. OF PLANT SCIENCE.
Effect of Soil Mixtures and Irrigation Met on Leaching of N in Golf Greens,
W79-01777

DELTA WATERFOWL RESEARCH STATIO PORTAGE LA PRAIRIE (MANITOBA).
Distribution and Production of Sago Pondw (Potamogeton Pectinatus L.) on a North Prairie Marsh,
W79-01629

DEPARTMENT OF AGRICULTURE, WATKINSVILLE, GA.
Remote Sensing of Water Levels in Small-Di eter Wells,
W79-01924

DEPARTMENT OF THE ENVIRONMENTA BURLINGTON (ONTARIO). WATER QUALITY DIV.
Short-Term Variation of the Chemical Comp tion of the Niagara River,
W79-01831

DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT A.G., FRANKFURTAM-MAIN (WEST GERMANY).
Process for Detoxification of Formaldeh Containing Waste Waters,
W79-01876

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, SC. SAVANNAH RIVER LAB.
Geochemical Interpretation of Kings Mount North Carolina, Orientation Area,
W79-01912

EAST COAST NEUROSCIENCE FOUNDATION, INC., NEW YORK.
The Effects of Short and Long Term Tempe ture Stress on Serotonin, Dopamine and No pinephrine Concentrations in Molluscan Ga lia,
W79-01684

EASTERN CONNECTICUT STATE COLL., WILLIMANTIC.
Analysis of Current Land-Use and Zoni Versus Selected Environmental Factors Drainage Basins Containing Lakes or Pon
W79-01589

EBARA INFILCO KABUSHKIK KAISHA, TOKYO (JAPAN). (ASSIGNEE).
Method and Apparatus for Purification Water,
W79-01886

ENSO-GUTZEIT OSAKEYHTIO, IMATRA (FINLAND).
Biological Method for Purifying Kraft Pulp M Condensates,
W79-01626

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W79-01834

ENVIRONMENTAL PROTECTION AGENCY DENVER, CO. REGION VIII.
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W79-01842

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W79-01844 5G

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR. INFRARED AND OPTICS DIV.
Remote Sensing of Wetlands,
W79-01642 7B

Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska,
W79-01825 5C

EXETER UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
The 1976 Drought and Nitrate Levels in the River Exe Basin,
W79-01504 5B

FEDERAL HIGHWAY ADMINISTRATION, PORTLAND, OR.
Ecological Recovery of Realigned Stream Channels,
W79-01515 6G

FEDERAL POWER COMMISSION, WASHINGTON, DC. BUREAU OF POWER.
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W79-01835 8C

FERGUSON AND MCILVEEN, BELFAST (NORTHERN IRELAND).
Air-Regulated Siphon Spillways at Spelga Dam,
W79-01925 8B

FISH AND WILDLIFE SERVICE, ANCHORAGE, AK. OFFICE OF BIOLOGICAL SERVICES AND COASTAL ECOSYSTEMS.
A Review of the Literature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska,
W79-01814 5C

FISH AND WILDLIFE SERVICE, WASHINGTON, DC. DIV. OF ECOLOGICAL SERVICES.
Wetlands of the United States: Their Extent and Their Value to Waterfowl and Other Wildlife,
W79-01635 6B

FISHERIES AND MARINE SERVICE, STE. ANNE DE BELLEVUE (QUEBEC). ARTIC BIOLOGICAL STATION.
Effects of Crude Oils on the Growth of Arctic Marine Phytoplankton,
W79-01784 5C

FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01774 5C

FLORIDA UNIV., GAINESVILLE. WATER RESOURCES RESEARCH CENTER.
Dolomitization in the Floridan Aquifer,
W79-01749 2F

FLORIDA UNIV., QUINCY. DEPT. OF AGRONOMY.
Seedling Emergence as Related to Temperature and Moisture Tension,
W79-01751 4D

FRAUNHOFER-GESELLSCHAFT FUER FOERDERUNG DER ANGEWANDTEN FORSCHUNG E. V., KARLSRUHE (GERMANY, F. R.).
Two Examples of Low Emission Technologies in the Pulp and Paper Industry,
W79-01627 5D

GEOLOGICAL SURVEY OF IRELAND AND MINEREX, LTD., DUBLIN.
Influence of Karst on Engineering in Ireland,
W79-01973 8G

GEOLOGICAL SURVEY OF JAMICA, KINGSTON. WATER RESOURCES DIV.
Ground Water Pollution of a Limestone Aquifer by Caustic Waste,
W79-01970 5B

GEOLOGICAL SURVEY, RESTON, VA. OFFICE OF THE CHIEF HYDROLOGIST.
Progress of Knowledge of Hydrology of Carbonate Rock Terranes - A Review,
W79-01933 2F

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Hydrology of Karst Features in Evaporite Deposits of the Upper Permian in Texas,
W79-01965 2F

GEOLOGICAL SURVEY, VERMILLION, SD.
Arsenic Levels in the Surface and Ground Waters Along Whitewood Creek, Belle Fourche River, and a Portion of the Cheyenne River, South Dakota,
W79-01897 5A

GEOLOGICAL SURVEY, WOODS HOLE, MA.
Comparative Studies on Extraction of Sediment Interstitial Waters: Discussion and Comment on the Current State of Interstitial Water Studies,
W79-01551 2K

GEORGIA DEPT. OF NATURAL RESOURCES, ATLANTA. EARTH AND WATER DIV.
Hydrogeology of a Cave Utilized for Public Water Supply: Rio Camuy Cave, Puerto Rico, U.S.A.,
W79-01957 2F

GEORGIA DEPT. OF NATURAL RESOURCES, ATLANTA. OFFICE OF PLANNING AND RESEARCH.
Inland Land Use Activities and Georgia's Coastal Waters.
W79-01651 4C

GEORGIA UNIV., ATHENS. DEPT. OF AGRONOMY.
Irrigation Effects on Vegetative and Reproductive Development of Three Soybean Cultivars,
W79-01708 3F

GEORGIA UNIV., ATHENS. DEPT. OF GEOLOGY.
Techniques for Sampling Salt Marsh Benthos and Burrows,
W79-01634 7B

GEORGIA UNIV., EXPERIMENT. DEPT. OF AGRONOMY.
Nitrapyrin Degradation and Movement in Soil,
W79-01706 2G

GIFU UNIV. (JAPAN).
Decoloring of Water-Soluble Azo Dyes by Ozone (In Japanese),
W79-01599 5D

GREAT LAKES PAPER CO., LTD., THUNDER BAY (ONTARIO).
Status of the Closed-Cycle Concept Kraft Mill at Great Lakes Paper Co.,
W79-01773 3E

GUELPH UNIV. (ONTARIO). DEPT. OF LAND RESOURCE SCIENCES.
Effects of Corn Stover, Manure, and Nitrogen on Soil Properties and Crop Yield,
W79-01781 3F

GULF COAST RESEARCH LAB., OCEAN SPRINGS, MS.
The Salt Marsh Flora of Mississippi,
W79-01632 2I

GULF STATES PAPER CORP., TUSCALOOSA, AL.
Adventures in Designing for 1984 Effluent Reduction,
W79-01608 5G

HEALTH EFFECTS RESEARCH LAB., CINCINNATI, OH.
Viruses in Finished Water: The Occoquan Experience,
W79-01577 5A

HORIBA, LTD., KYOTO (JAPAN). (ASSIGNEE).
Apparatus for the Continuous Measurement of the Concentration of Oil,
W79-01867 5A

HOUSTON UNIV., TX. COLL. OF ARCHITECTURE.
A Land Study for Downtown Lake Charles,
W79-01838 6B

HYDROCHEMICAL INST., NOVOCHERKASSK (USSR).
Problems in Automating the Monitoring of Surface Water Chemistry,
W79-01507 5A

HYDROLOGIC ENGINEERING CENTER, DAVIS, CA.
Physical and Economic Feasibility of Nonstructural Flood Plain Management Measures,
W79-01833 6F

HYDROTECHNICS, ALBUQUERQUE, NM.
Use of Thermonics in Foundation Studies in Karstic Terrane,
W79-01977 8E

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W79-01845 6B

ILLINOIS STATE WATER SURVEY, URBANA. HYDROLOGY SECTION.
Lake Shore Protection Against Wind-Generated Waves,
W79-01917 2H

ILLINOIS UNIV. AT CHICAGO CIRCLE. DEPT. OF GEOLOGICAL SCIENCES.
Road Salts and Quality of Ground-Water from a Dolomite Aquifer in the Chicago Area,
W79-01968 5B

ILLINOIS UNIV. AT URABANA-CHAMPAIGN. DEPT. OF AGRONOMY.
Effect of Nitrapyrin on Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01717 2G

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRONOMY.
Differential Response of Soybean Varieties to Soil Cadmium,
W79-01826 3F

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). APPLIED GEOCHEMISTRY RESEARCH GROUP.
Application in the Water Industry of Regional Geochemical Maps of England and Wales,
W79-01501 5B

INDIANA UNIV. AT BLOOMINGTON. DEPT. OF GEOLOGY.
Summary of Geohydrologic Relationships in the Lost River Watershed, Indiana, Applied to Water Use and Environment,
W79-01939 2F

INSTITUT FOR SPOREPLANTER, COPENHAGEN(DENMARK).
Marine Algal Vegetation in Shallow Water Around the Danish Island of Saltholm, the Sound,
W79-01996 5C

INSTITUTE FOR GEOLOGICAL AND GEOPHYSICAL RESEARCH, BELGRADE (YUGOSLAVIA).
A Contribution to the Study of the Problem of Karst Regionalization,
W79-01936 2F

Current Problems in the Rational Exploitation of Karst Water,
W79-01958 2F

Artificial Works and Efficient Interception of Groundwater in Karst,
W79-01960 2F

INSTITUTE OF GEOLOGICAL SCIENCES, LONDON (ENGLAND).
The Use of Inclined Boreholes for Well Development,
W79-01503 8B

INSTITUTE OF PAPER CHEMISTRY, APPLETON, WI.
Treatment of Bleach Plant Effluents by Combined Reverse Osmosis and Freeze Concentration Process,
W79-01610 5D

Characteristics and Use of Nonsetteable Solids by an Aquatic Food Chain Organism,
W79-01617 5C

Removal of Color from Carbonate Pulping Effluent The Calcium-Magnesium Coagulation Process,
W79-01769 5D

Determination of Polychlorinated Biphenyls in paper Mill Effluents - The Influence of Suspended Solids,
W79-01771 5A

INSTYTUT CELULOZOWO-PAPIERNICZY, LODZ (POLAND).
Elimination of Impurities Contained in Kraft Mill Condensates (Badania nad usuwaniem zanieczyszczen wystepujacych w kondensatach z celulozowni siarczanowych),
W79-01602 5D

IOWA STATE UNIV., AMES. DEPT OF EARTH SCIENCES.
Distribution and Density of Dolines in Areas of Mantled Karst,
W79-01944 2F

Model Analysis of Closed Systems in Karstic Aquifers,
W79-01952 2F

IOWA UNIV., IOWA CITY. DEPT. OF GEOGRAPHY.
Fluvial Adjustments to the Spread of Tamarisk in the Colorado Plateau Region,
W79-01919 2J

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
Ralston Creek Hourly Precipitation Model,
W79-01727 2B

A Manual for Hydrologic Time Series Deseasonalization and Serial Dependence Reduction,
W79-01989 7C

ISOREL, PUTEAUX (FRANCE).
How and Why We Chose Integral Recycling (At the Isorel Fiberboard Plant, Castlejaloux, France),
W79-01622 3E

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Applications of Mixing Experiments to Estuaries,
W79-01911 2L

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF PATHOBIOLOGY.
Effects of Petroleum Exposure on the Breeding Ecology of the Gulf of Alaska Herring Gull Group (Larus Argentatus X Larus Glaucescens)M,
W79-01803 5C

JORDAN (EDWARD C.) CO., INC., PORTLAND, ME.
Design and Operation of Great Northern Paper Company's Secondary Treatment Facilities at East Millinocket, Maine,
W79-01616 5D

KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRONOMY.
Influence of K on the Uptake, Translocation, and Reduction of Nitrate by Barley Seedlings,
W79-01693 3F

KENTUCKY UNIV., LEXINGTON. DEPT. OF CIVIL ENGINEERING.
Prediction of Flow Hydraulics for Vegetated Channels,
W79-01726 8B

KENTUCKY WATER RESOURCES RESEARCH, INST., LEXINGTON.
Development of a New Technique for the Analysis of Pesticides in Water,
W79-01981 5A

LA TROBE UNIV., BUNDOORA (VICTORIA). DEPT. OF INORGANIC AND ANALYTICAL CHEMISTRY.
The Phosphorus Status of the Sediments of Three Eutrophic Lakes in Victoria,
W79-01697 5C

LAMONG-DOHERTY GEOLOGICAL OBSERVATORY, PALLISADES, NY.
Sources of Heavy Metals in Sediments of the Hudson River Estuary,
W79-01678 5B

LMINNESOTA UNIV., ST. PAUL. DEPT. OF SOIL SCIENCE.
Fertilizer Placement Effects on Soybean Seed Yield, N2 Fixation, and 33P Uptake,
W79-01782 3F

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF AGRONOMY.
Utilization of Labelled Urea and Ammonium Sulfate by Lowland Rice,
W79-01707 2K

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF AGRONOMY; AND LOUISIANA AGRICULTURAL EXPERIMENT STATION, BATON ROUGE.
Transport of Reactive Solutes During Transient, Unsaturated Water Flow in Multilayered Soils,
W79-01921 2G

LOUISIANA STATE UNIV., BATON ROUGE. SCHOOL OF FORESTRY AND WILDLIFE MANAGEMENT.
Use of Landsat Data to Relate Water Depth to Observed Area of Inundation in Coastal Marshes,
W79-01637 7B

LOUISIANA TECH UNIV., RUSTON. COLL. OF ENGINEERING.
Reclamation of Polluted Farm Ponds,
W79-01988 5G

LOUISVILLE UNIV., KY. DEPT. OF BIOLOGY.
Potential Interaction of Microorganisms and Pollutants from Petroleum Development,
W79-01800 5C

LYON-1 UNIV., VILLEURBANNE (FRANCE). LAB. DE PHYSIOLOGIE GENERALE ET COMPAREE.
Effect of Environmental Temperature on Biosynthesis of Liver Phosphatidyl-Choline in the Trout (Salmo Gairdnerii),
W79-01680 5C

MACHINEFARBIEK GEURTSEN DEVENTER, NV. (NETHERLANDS). (ASSIGNEE).
Apparatuses to Separate Mixtures of Liquids of Different Specific Gravities,
W79-01865 5G

MAINE UNIV. AT ORONO. DEPT. OF CIVIL ENGINEERING.
Application of Geotechnical Theories to the Landfill Disposal of Papermill Sludges,
W79-01620 5E

MANITOBA UNIV., WINNPEG. DEPT. OF ZOOLOGY.
Vertebral Variation in Zebrafish (Brachydanio Rerio) Related to the Prefertilization Temperature History of Their Parents,
W79-01687 5C

MANOMET BIRD OBSERVATORY, MA.
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W79-01658 5E

ARATHWADA UNIV., AURANGABAD (DIA). DEPT. OF ZOOLOGY.
Thermal Acclimation Induced Compensation in Biochemical Constituents of the Indian Freshwater Leech, Poecilobdella Viridis (Blanchard),
W79-01700 5C

SSACHUSETTS UNIV., AMHERST. DEPT. BOTANY.
Genetic Damage to a Fern Population Growing a Polluted Environment: Segregation and Description of Gametophyte Mutants,
W79-01745 5C

SSACHUSETTS UNIV., AMHERST. DEPT. PLANT AND SOIL SCIENCES.
A Method of Promoting Penetration of Water into Tight, Sloping Soil Under Drip Irrigation,
W79-01719 3F

SSACHUSETTS UNIV., AMHERST. DEPT. ZOOLOGY.
Feeding and Growth Rates of Polinices Duplicatus Preying on Mya Arenaria at Barnstable Harbor, Massachusetts,
W79-01669 5C

SSACHUSSETS UNIV., WALTHAM. DEPT. ENVIRONMENTAL SCIENCES.
Microfloral Response to Aquatic Weed Decomposition,
W79-01746 5C

AD CORP., KINGSPORT, TN.
Successful Mead (Corporation) Program to Reduce Effluent Volume,
W79-01612 5D

MORIAL UNIV. OF NEWFOUNDLAND, JOHN'S. MARINE SCIENCE RESEARCH B.
Seasonal Dynamics of Cu2+, Zn2+, Ca2+, and Mg2+ in Gonads and Liver of Winter Flounder (Pseudopleuronectes Americanus): Evidence for Summer Storage of Zn for Winter Gonad Development in Females,
W79-01677 5C

CHIGAN STATE UNIV., EAST LANSING.
Zoobenthos in Thermal Discharge to Western Lake Erie,
W79-01675 5C

CHIGAN UNIV., ANN ARBOR. CIVIL GINEERING AND NATURAL SOURCES.
Innovative Management Concept for 208 Planning,
W79-01848 5G

CHIGAN UNIV., ANN ARBOR. COASTAL NE LAB.
Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan, Appendix III,
W79-01531 4A

Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan, Appendix VII,
W79-01533 4A

Comparison of Field Data Collections to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan, Appendix III,
W79-01534 4A

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF NATURAL RESOURCES.
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A), Appendix A: In Situ Experiments on the Dissolved and Colloidal State of Iron in an Acid Bog Lake,
W79-01597 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A) Appendix B: The Influence of Colloidal Organic Matter (COM) Upon Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01598 5C

MICHIGAN UNIV., ANN ARBOR. WETLANDS ECOSYSTEM RESEARCH GROUP.
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W79-01643 5C

MIDWEST RESEARCH INST., KANSAS CITY, MO.
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W79-01764 5E

MINISTERSTVO BUMAZHONI PROMYSHLENNOST (USSR).
Disk Filters for Effluent Purification (Diskovye fil'try dlya ochistki stochnykh vod),
W79-01594 5D

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF BOTANY.
Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01750 5C

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF CIVIL ENGINEERING.
Wave Forces on Causeway-Type Coastal Bridges,
W79-01983 8B

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. DEPT. OF ZOOLOGY.
The Production of Pulp from Marsh Grass.
W79-01630 4A

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE. WATER RESOURCES RESEARCH INST.
Effects of Nutrient Enrichment of a Salt Marsh on Diatom Communities,
W79-01982 5C

MISSISSIPPI WATER RESOURCES RESEARCH INST., OXFORD.
Model Aids Managerial Effectiveness in Municipal Water Systems,
W79-01741 5G

MISSOURI AGRICULTURAL EXPERIMENT STATION, COLUMBIA.
Profile Modification of a Fragiudalf to Increase Crop Production,
W79-01740 3F

MISSOURI UNIV.-COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Computer Model for Predicting Pollution in the Missouri,
W79-01905 5B

MISSOURI UNIV.-COLUMBIA. DEPT. OF GEOLOGY.
Geochemistry of Ground Water, Southwestern Missouri,
W79-01535 5B

MISSOURI UNIV., COLUMBIA. SCHOOL OF FORESTRY, FISHERIES AND WILDLIFE.
Early Conflicts Over Effluent Irrigation in Missouri's Ozarks,
W79-01971 6E

Subsurface Water Behavior and Sewage Effluent Irrigation in the Missouri Ozarks,
W79-01972 5B

MISSOURI UNIV.-KANSAS CITY. DEPT. OF BIOLOGY.
Citric Acid Enhancement of Copper Sulfate Toxicity to Blue-Green Algae and Other Nuisance Organisms,
W79-01906 5C

MISSOURI UNIV.-ROLLA
Heavy Metal Additions to Waters of the Joplin Area, Tri-State Mining District, Missouri,
W79-01969 5B

MITRE CORP., MCLEAN, VA. METREK DIV.
Clean Up Mixed Waste Streams -- The Tank Truck Washing Example.
W79-01583 5D

MONONGAHELA NATIONAL FOREST, ELKINS, WV.
The A, B, C's of Finding and Delineating Caves with Apparent Resistivity Measurements,
W79-01941 2F

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Hydrologic Characteristics of Coal-Mine Spoils, Southeastern Montana,
W79-01542 5B

MONTANA STATE UNIV., BOZEMAN.
The Effect of Irrigation on the Survival and Development of Parasitic Nematode Larvae in Western Montana,
W79-01540 5C

MONTANA STATE UNIV., BOZEMAN. DEPT. OF CHEMISTRY.
Predicting the Anaerobic Degradation of Organic Chemical Pollutants in Waste Water Treatment Plants from Their ELectrochemical Reduction Behavior,
W79-01539 5B

MORAN (THOMAS L.), AMARILLO, TX. (ASSIGNEE).
Method and Means of Treating Water Wells,
W79-01871 3B

NALCO CHEMICAL CO., OAK BROOK, IL. (ASSIGNEE).
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W79-01875 5D

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HOUSTON, TX. LYNDON B. JOHNSON SPACE CENTER.
Measurement of Total Organic Concentration in Water,
W79-01600 5A

NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS, WASHINGTON, DC.
Sediment Control Conference, Held at Helena Montana on December 15, 1972.
W79-01523 4D

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W79-01509 2A

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W79-01601 5D

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W79-01756 5A

NATIONAL FERTILIZER DEVELOPMENT CENTER, MUSCLE SHOALS, AL.
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W79-01705 3F

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Determination of Stability Constants of Metal-Humic Acid Complexes by Potentiometric Titration and Ion-Selective Electrodes,
W79-01721 5A

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Acute and Chronic Toxicity, Uptake and Depuration, and Sublethal Response of Alaska Marine Organisms to Petroleum Hydrocarbons,
W79-01790 5C

NATIONAL MARINE FISHERIES SERVICE, AUKE BAY, AK. NORTHWEST AND ALASKA FISHERIES CENTER.
Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components,
W79-01812 5C

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The Effects of Petroleum Hydrocarbons on Chemoreception in Dungeness Crab Cancer Magister.
W79-01808 5C

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Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological, and Behavioral Indices,
W79-01791 5C

Biological Fate of Metals in Fish,
W79-01792 5C

The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of fish Pathology in Alaskan Marine Waters.
W79-01793 5C

Physiological and Behavioral Effects,
W79-01794 5C

Morphology,
W79-01795 5C

Overview,
W79-01796 5C

Interactive Effects of Residues of Hydrocarbons, Chlorinated Hydrocarbons, and Heavy Metals on the Metabolism and Bioaccumulation of Petroleum Hydrocarbons in Marine Fish,
W79-01809 5C

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976. A Historical Review. Volume 1,
W79-01819 5C

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W79-01820 5C

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W79-01797 5C

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W79-01806 5C

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W79-01805 5C

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W79-01822

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W79-01938

NATIONAL PARK SERVICE, SANTA FE, NM SOUTHWEST REGION.
Alpha Radiation Monitoring of National Pa Service Administered Caves in United Stat
W79-01943

NEBRASKA UNIV., LINCOLN.
Application of Remote Sensing in Estimati Evapotranspiration in the Platte River Bas
W79-01521

NEBRASKA UNIV., LINCOLN. DEPT. OF GEOGRAPHY.
Analysis of Seasonal Persistence of Climate Nebraska,
W79-01538

NEBRASKA UNIV., NORTH PLATTE. DEPT. OF AGRONOMY.
Nitrogen Losses from Sprinkler-Applied Nitr gen Fertilizer,
W79-01893

NEVADA UNIV. SYSTEM, RENO. WATER RESOURCES CENTER.
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W79-01896

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W79-01904

NEW ORLEANS UNIV., LA. URBAN STUDIE INST.
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W79-01650

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W79-01603

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W79-01775

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On the Management of Karst Aquifers in Sau Arabia,
W79-01962

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W79-01841

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W79-01659 5C

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W79-01715 3F

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The Contribution of Mercury and Chlorinated Organics from Urban Runoff,
W79-01918 5B

OAK RIDGE NATIONAL LAB., TN.
Parametric Study and Preliminary Evaluation of Reverse Osmosis for Seawater Desalination,
W79-01580 3A

Biodegradation of Phenolic Waste Liquors in Stirred-Tank, Packed-Bed, and Fluidized-Bed Bioreactors,
W79-01762 5D

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, WOOSTER. DEPT. OF AGRONOMY.
Physical, Chemical, and Mineralogical Properties of Fluvial Unconsolidated Bottom Sediments in Northwestern Ohio,
W79-01926 2J

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRONOMY.
Some Factors Affecting Denitrification in Soils Irrigated with Wastewater,
W79-01729 5E

OHIO UNIV., ATHENS. DEPT. OF GEOLOGY.
Hydrological Problems of Jufra Well Field, Libya,
W79-01963 2F

OKLAHOMA COOPERATIVE FISHERIES RESEARCH UNIT, STILLWATER.
Evaluation of Stream Improvement Practices in Southeastern Trout Streams,
W79-01590 8I

OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING.
Factors Affecting Sediment Phosphorus Release in Lqke Carl Blackwell, Oklahoma,
W79-01984 5C

OREGON STATE UNIV., CORVALLIS.
Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W79-01823 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF MICROBIOLOGY.
Use of Fecal Streptococci as Indicators of Pollution in Soil,
W79-01738 5B

OREGON STATE UNIV., CORVALLIS. DEPT. OF MICROBIOLOGY; AND OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Microbial Activity and Crude Oil-Microbial Interactions in Water and Sediments,
W79-01801 5C

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Nitrous Oxide in the Oxygen Minimum of the Eastern Tropical North Pacific: Evidence for its Consumption During Denitrification and Possible Mechanisms for its Production,
W79-01997 5C

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, PARIS (FRANCE). DIRECTORATE FOR THE ENVIRONMENT.
Reduction of the Water-Polluting Discharges from a Bleached Sulfate Pulp Mill (Reduction de la charge de pollution de l'eau provenant d'une usine de pate au sulfate blanchie),
W79-01625 5D

OZARK UNDERGROUND LAB., PROTEM, MO.
A Model for Relating Land Use and Groundwater Quality in Southern Missouri,
W79-01964 2F

PAHLAVI UNIV., SHIRAZ (IRAN). DEPT. OF IRRIGATION.
Effect of Soil Matric Potential and Seeding Depth on Emergence of Barley,
W79-01718 3F

PALM BEACH COUNTY BOARD OF COMMISSIONERS, FL.
Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01839 5D

Public Hearing on the Draft Environmental Impact Statement Relating to Palm Beach County Sewage Treatment Improvement Program.
W79-01840 5D

PARIS-6 UNIV (FRANCE). LAB. ARAGO.
Filter-Feeding Ethology of Benthic Invertebrates (Ascidians). V. Influence of Temperature on Pumping, Filtration, and Digestion Rates and Rhythms in Phallusia Mamillata,
W79-01653 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. COLL. OF AGRICULTURE.
Ecology and Pathology of Wildlife in Response to Spray Irrigation of Chlorinated Sewage Effluent - Phase I,
W79-01902 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Effect of Fertilization on Penncross Creeping Bentgrass,
W79-01754 3F

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Computing Evaporation for Inland Water Bodies under a Variety of Fetch and Atmospheric Stability Conditions,
W79-01895 2D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. MATERIALS RESEARCH LAB.; AND PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF GEOSCIENCES.
Conceptual Models for Carbonate Aquifers: Revisited,
W79-01949 2F

PHILIPPINES UNIV., COLLEGE. COLL. OF AGRICULTURE.
Effect of Slow Release Fertilizer on Fertilizer Residues and on Yield and Composition of Flue-Cured Tobacco,
W79-01736 3F

PIRELLI FURLANIS - APPLICAZIONI IDRAULICHE AGRICOLE GOMMA S.P.A., MILAN (ITALY). (ASSIGNEE).
Collapsible and Expansible Barrage,
W79-01869 8A

Manoeuverable Weir,
W79-01870 8G

PURDUE UNIV., LAFAYETTE, IN. DEPT. OF AGRONOMY.
A Methodology for Testing the Accuracy of Yield Predictions from Weather-Yield Regression Models for Corn,
W79-01766 3F

PURDUE UNIV., LAFAYETTE, IN. WATER RESOURCES RESEARCH CENTER.
Systematic Development of Institutional and Legal Prescriptions for Urban Water Use and Management,
W79-01891 6E

RAIN BIRD SPRINKLER MFG. CORP., GLENORA, CA.
An Introduction to Emission Uniformity,
W79-01686 8B

RAND CORP., SANTA MONICA, CA.
Three-Dimensional Flow Simulation in Estuaries,
W79-01524 2L

REITZ AND JENS, INC., ST. LOUIS, MD.
Construction Methods which Recognize the Mechanics of Sinkhole Development,
W79-01974 8G

RESEARCH AND DEVELOPMENT INST. OF WOOD AND TIMBER, BRATISLAVA (CZECHOSLOVAKIA).
Potential for an Improved Return on Investment in the Production of Wood Fiberboard Using the Wet Process (Moznosti zvysenia efektivnosti vyroby drevovlaknitych dosak mokrym sposobom),
W79-01595 5D

RESEARCH AND PLANNING CONSULTANTS, INC., AUSTIN, TX.
Texas Coastal Management Program Ecological Systems Component, User's Manual
W79-01787 5C

RESEARCH COUNCIL OF ALBERTA, EDMONTON.
Groundwater Potential of the Karst Regions of Alberta, Canada,
W79-01955 2F

RESOURCE MANAGEMENT ASSOCIATES, LAFAYETTE, CA.
Design of Field Experiments to Determine the Ecological Effects of Petroleum in Intertidal Ecosystems,
W79-01810 5C

RHODE ISLAND UNIV., KINGSTON. COLL. OF PHARMACY.
Interaction of Chlorine and Organic Molecules--Effects of Inorganics,
W79-01903 5B

RHODE ISLAND UNIV., KINGSTON. DEPT. OF GEOLOGY.
Geophysical Investigations Over Karst Water in Southeastern Missouri,
W79-01942 2F

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Olisthodiscus Luteus (Chrysophyceae) I. Effects of Salinity and Temperature on Growth, Mortility and Survival,
W79-01682 5C

RHODE (RICHARD), GLASGOW, MT. (ASSIGNEE).
Flow Control Device for an Irrigation Ditch,
W79-01868 3F

ROYAL VETERINARY AND AGRICULTURAL COLL., COPENHAGEN (DENMARK).
Differences Among Genotypes of Corn in the Kinetics of P Uptake,
W79-01733 3F

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF BIOCHEMISTRY AND MICROBIOLOGY.
Biodegradation of Oil Slicks in the Marine Environment,
W79-01913 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ENVIRONMENTAL RESOURCES.
Impact of Offshore Oil and Gas Development on the Coastal Zone: Reforming the Impact Assessment Process,
W79-01783 6G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. WATER RESOURCES RESEARCH INST.
The West Branch Shabakunk Creek: A Surveillance Report of Physical Conditions and Biological Health,
W79-01543 5C

Harry's Brook - A Surveillance Report of Physical Conditions and Biological Health,
W79-01907 5C

SAINT LAWRENCE-EASTERN ONTARIO COMMISSION, WATERTOWN, NY.
Engineering Studies for a Contract for Field Investigation of High Water Damage in Oswego County, New York, Appendix IV,
W79-01532 4A

SAVANNAH RIVER ECOLOGY LAB., AIKEN, SC.
Temperature Adaptation in the Freshwater Snail, Helisoma Trivolvis (Say),, in an Artificially Heated Reservoir in the Southeastern United States,
W79-01681 5C

SCRIPPS INST. OF OCEANOGRAPHY, LA JOLLA, CA.
Lead Accumulation Rates in Tissues of the Estuarine Teleost Fish, Gillichthys Mirabilis: Salinity and Temperature Effects,
W79-01667 5C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CA. PHYSIOLOGICAL RESEARCH LAB.
Effects of Oiling on Temperature Regulation in Sea Otters,
W79-01804 5C

SCS ENGINEERS, LONG BEACH, CA.
A Study of Leachate from Dredged Material in Upland Areas and/or in Productive Uses,
W79-01660 5B

SHEFFIELD UNIV. (ENGLAND). DEPT. OF CIVIL AND STRUCTURAL ENGINEERING.
Flow to a Well in an Unconfined Fractured Aquifer,
W79-01953 2F

SIGMA RESEARCH, INC., RICHLAND, WA.
Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, Vol. I. Working Group Results,
W79-01755 5C

SIRRINE (J. E.), CO., RALEIGH, NC.
Spill Containment and Effluent Management Program at the Hopewell Mill, Continental Forest Industries, The Continental Group, Inc.,
W79-01614 5D

SMITH COLL., NORTHAMPTON, MA. DEPT. OF BIOLOGICAL SCIENCES.
Morphological Variation of Elodea in Western Massachusetts: Field and Laboratory Studies,
W79-01743 5C

The Spread of Several Introduced or Recently Invading Aquatic in Western Massachusetts,
W79-01744 5C

SOIL CONSERVATION SERVICE, KANKAKEE, IL.
The Timeliness Benefit of Subsurface Drainage,
W79-01728 3F

SOUTH CAROLINA SEA GRANT PROGRAM, CHARLESTON.
Elite Attitudes Toward Marshlands in South Carolina,
W79-01648 6B

SOUTH CAROLINA UNIV., COLUMBIA. BELLE W. BARUCH INST. FOR MARINE BIOLOGY AND COASTAL RESEARCH.
The Influence of Constant and Cyclic Acclimation Temperatures on the Metabolic Rates of Panopeus Herbstii and Uca Pugilator,
W79-01685 5C

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.
Microstructure of Agglomerated Suspended Sediments in Northern Chesapeake Bay Estuary,
W79-01923 2L

SOUTH CAROLINA WATER RESOURCES COMMISSION, COLUMBIA.
Ground-Water Development Problems Associated with Folded Carbonate-Rock Aquifers in the Irondale Area, Alabama,
W79-01956 2F

SOUTH DAKOTA DEPT. OF ENVIRONMENTAL PROTECTION, PIERRE.
Comprehensive Water Quality Management fo the State of South Dakota. 303(E) Basin Plan fo the Minnesota River Basin.
W79-01846 5C

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF PLANT SCIENCE.
Relationship Between Soil Test and Small Grai Response to P Fertilization in Field Experiments,
W79-01786 3F

SOUTH DAKOTA STATE UNIV., BROOKINGS. REMOTE SENSING INST.
Inventory of Wetland Habitat using Remot Sensing for the Proposed OAHE Irrigation Uni in Eastern North Dakota
W79-01636 3F

ST. REGIS PAPER CO., PENSACOLA.
Studies of Membrane Processes for Pulp Mi Pollution Control,
W79-01611 5F

STANDARD OIL CO. (INDIANA), CHICAGO, IL.
Optimize the Effluent System. Part 6: Biochem istry of Activated Sludge Process.
W79-01759 5F

STATE UNIV. OF NEW YORK AT SYRACUSE. DEPT. OF FOREST BOTANY.
Wetland Plant Communities Along the Easter Shoreline of Lake Ontario,
W79-01644 2

STATE UNIV. OF NEW YORK, BUFFALO. GREAT LAKES LAB.
Aquatic Disposal Field Investigations, Ashtabu la River Disposal Site, Ohio; Evaluative Sum mary,
W79-01657 5F

STATE UNIV. OF NEW YORK COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY, SYRACUSE.
Biological Impact of Various Chlorinated Pher olics and Related Compounds on Daphni Magna,
W79-01618 5C

STEVENS INST. OF TECH. HOBOKEN, NJ.
Mathematical Models of Dissolved Oxyge Concentration in Fresh Water,
W79-01998 5C

SUWANNEE RIVER WATER MANAGEMENT DISTRICT, FL.
Exploration and Environmental Investigation o the Peacock Springs Cave System,
W79-01961 2F

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., GOTEBORG.
Possible Changes in Aerosol Composition Du to Departure from Equilibrium Condition During Sampling,
W79-01554 5A

SYSTEMS, SCIENCE AND SOFTWARE, LA JOLLA, CA.
Simulation of Fluid-Rock Interactions in a Geo thermal Basin,
W79-01516 2F

TECHNION - ISRAEL INST. OF TECH., HAIFA. FACULTY OF AGRICULTURAL ENGINEERING.
Simulation of Nitrogen Processes in Soils fo Estimating Fertilizer Requirements,
W79-01713 2F

ECHNISCHE HOCHSCHULE, RAZ(AUSTRIA). DEPT. OF YDROGEOLOGY.

Results of Tracing Experiments for Construction of Reservoirs in Karstic Regions,
W79-01976 8E

ELSCO INDUSTRIES, DALLAS, TX. ASSIGNEE).

Rotary Sprinkler Impact Arm Spring Adjustment,
W79-01872 3F

ENNESSEE UNIV., KNOXVILLE.

Part I: Application of Pulse Polarography and Pulse Anodic Stripping to the Determination of Selected Heavy Metals in Natural Waters--Part II: Application of Controlled Potential Coulometric Techniques to the Determination of Uranium,
W79-01517 5A

The Verification of LANDSAT Data in the Geographical Analysis of Wetlands in West Tennessee,
W79-01639 7B

ENNESSEE UNIVERSITY SPACE INST. ULLAHOMA. REMOTE SENSING DIV.

Application of LANDSAT Image Wetland Study and Land Classification in West Tennessee,
W79-01638 7B

ENNESSEE VALLEY AUTHORITY, HATTANOOGA.

Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants,
W79-01674 5C

ENNESSEE VALLEY AUTHORITY, NOXVILLE.

The Hydrology of Karst Urban Areas,
W79-01948 2A

EXAS A AND M UNIV., COLLEGE 'ATION. DEPT. OF AGRICULTURAL CONOMICS AND RURAL SOCIOLOGY.

The Impact of Energy Shortage and Cost on Irrigation for the High Plains and Trans Pecos Regions of Texas,
W79-01894 3F

EXAS A AND M UNIV., COLLEGE 'ATION. DEPT. OF SOIL AND CROP IENCES.

Arsenic Pollution from Underdrainage and Runoff from Golf Greens,
W79-01752 5B

EXAS AGRICULTURAL EXTENSION ERVICE, COLLEGE STATION.

Sprinkler Irrigation Practices and Water Losses: Water Shortages Underline Need for Conservation,
W79-01673 3F

EXAS DEPT. OF WATER RESOURCES, USTIN.

Analytical Study of the Ogallala Aquifer in Terry County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01927 7C

Analytical Study of the Ogallala Aquifer in Yoakum County Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well yields,
W79-01928 7C

Occurrence and Quality of Ground Water in Baylor County, Texas,
W79-01929 7C

Analytical Study of the Ogallala Aquifer in Cochran County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01930 7C

Analytical Study of the Ogallala Aquifer in Lubbock County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W79-01931 7C

Artificial Ground-Water Recharge as a Water-Management Technique on the Southern High Plains of Texas and New Mexico,
W79-01992 4B

TEXAS UNIV. AT AUSTIN. DEPT. OF GEOLOGICAL SCIENCES; AND TEXAS UNIV. AT AUSTIN. BUREAU OF ECONOMIC GEOLOGY.

Faults as Positive and Negative Influences on Ground-Water Flow and Conduit Enlargement,
W79-01951 2F

TEXAS UNIV.-DALLAS, RICHARDSON.

Eutrophication of Water Bodies: Insights for an Age-Old Problem,
W79-02000 5C

TORONTO UNIV. (ONTARIO).

Non-Waste Production of Bleached Kraft Pulp,
W79-01624 3E

TREADWELL CORP., NEW YORK. (ASSIGNEE).

Process for Removing Cyanide-Containing Components from Aqueous Media,
W79-01884 5D

TUFTS UNIV., MEDFORD, MA.

Effects of Chlorination on Differentiated Coliform Groups,
W79-01695 5C

UNION CARBIDE CORP., OAK RIDGE, TN. COMPUTER SCIENCES DIV.

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part I. Model Structure,
W79-01946 2A

Numerical Simulation of Watershed Response Using the Unified Transport Model - Part II. Validation Studies,
W79-01947 2A

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. SCHOOL OF BUSINESS ADMINISTRATIONS.

Factors Affecting the Use of an Artificial Beach: A Case Study on Mississippi Gulf Coast,
W79-01979 6B

USV PHARMACEUTICAL CORP., TUCKAHOE, NY.

Measurements of Phytoplankton-Protein Content with the Heated Biuret-Folin Assay,
W79-01995 5A

UTAH STATE UNIV., LOGAN.

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01734 3C

UTAH UNIV., LOGAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.

Hydraulic Friction Loss in Small Diameter Plastic Pipelines,
W79-01915 8B

VEB DRUCK- UND SPEZIALPAPIERE, GOLZERN (EAST GERMANY).

Use in the Brick Industry of Highly Discolored Fibers Recovered from the Final Effluent Clarifier of a Paper Mill (Verwertung von stark verfaerbtem Fangstoff aus der Rest-abwasserklaeranlage einer Papierfabrik in der Ziegelindustrie),
W79-01607 3E

VEB KOMPLETTE CHEMIEANLAGEN, DRESDEN (EAST GERMANY).

Mobile Centrifugal Unit for Use in Dewatering Paper Sludges (Die fahrbare Zentrifugenanlage beim Einsatz zur Entwaesserung von Papierschlaemmen),
W79-01606 5E

VICTORIA DEPT. OF AGRICULTURE, TATURA (AUSTRALIA). HORTICULTURE RESEARCH STATION.

Irrigation Timing-Its Influence on the Effects of Salinity and Waterlogging Stresses in Tobacco Plants,
W79-01720 3F

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.

Biological Assessment of Water Quality in a Large River System: An Evaluation of a Method for Fishes,
W79-01553 5A

Toxicity of Intermittent Chlorination to Freshwater Fish: Influence of Temperature and Chlorine Form,
W79-01670 5C

VIZUGYI IGAZGATOSAG, PECS (HUNGARY).

The Development and Management of Karst Water Resources in the City of Pecs and its Vicinity, Hungary,
W79-01959 2F

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL).

Alternate Drying and Rewetting Effects on Chemical and Physical Properties and Moisture-Salinity Relationships of a Histosol,
W79-01699 2G

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL). INST. OF SOILS AND WATER.

Crop Water Requirement in Relation to Climate and Soil,
W79-01712 2G

Fertilization Decision Model-A Synthesis of Soil and Plant Parameters in a Computerized Program,
W79-01714 2G

WASHINGTON STATE UNIV., PULLMAN. COLL. OF AGRICULTURE RESEARCH CENTER.

Evaluation of Peat and Granular Inoculum for Soybean Yield and N Fixation Under Irrigation,
W79-01702 3F

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRONOMY AND SOILS.

An Analysis of Sensible and Latent Heat Flow in a Partially Frozen Unsaturated Soil,
W79-01711 2G

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Contemporary and Historical Trace Metal Loadings to the Sediments of Four Lakes of the Lake Washington Drainage,
W79-01985 5B

WASHINGTON UNIV., SEATTLE. DEPT. OF MECHANICAL ENGINEERING.
Floating Breakwaters: An Idea Whose Time Has Returned,
W79-01525 8B

Floating Breakwater Field Assessment Program, Friday Harbor, Washington,
W79-01526 8B

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
Determination and Description of Knowledge of the Distribution, Abundance, and Timing of Salmonids in the Gulf of Alaska and Bering Sea. A Supplement,
W79-01815 5C

WASTE RESEARCH UNIV, OXON (ENGLAND). HARWELL LAB.
The Removal of Arsenic(V) from Acidic Solutions,
W79-01765 5D

WELEX, VENICE, LA.
How to Insure a Good Bridge Plug Job,
W79-01549 8F

WEST VIRGINIA UNIV., MORGANTOWN. DEPT. OF GEOLOGY AND GEOGRAPHY.
Morphometric Analysis of Dolines for Predicting Ground Subsidence, Monroe County, West Virginia,
W79-01945 2F

Water Well Productivity Related to Photo-Lineaments in Carbonates of Frederick Valley, Maryland,
W79-01954 2F

Chloride Ion Variations in Some Springs of the Green-Brier Limestone Karst of West Virginia,
W79-01967 5B

WESTERN KENTUCKY UNIVERSITY, BOWLING GREEN, KY. DEPT. OF GEOGRAPHY AND GEOLOGY.
Karst Topography and Its Occurrence in Kentucky,
W79-01937 2F

WESTGATE RESEARCH CORP., MARINA DEL REY, CA.
UV-Ozone Water Oxidation/Sterilization Process,
W79-01581 5D

WESTVACO CORP., COVINGTON, VA.
The Relationship of Biological Population to Activated Sludge Plant Performance,
W79-01619 5D

WIEZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL). DEPT. OF ISOTOPE RESEARCH.
A Study of Parameter Estimation Procedures of a Model for Lake Phosphorus Dynamics,
W79-01994 5C

WILLIAMS COLL., WILLIAMSTOWN, MA. DEPT. OF GEOLOGY.
Seasonal Variation in Beach Erosion and Sedimentation on the Oregon Coast,
W79-01920 2J

WISCONSIN UNIV.-MADISON. DEPT. OF AGRICULTURAL ECONOMICS.
Efficiency and Equity in Pricing Local Public Services: The Case of Wastewater,
W79-01544 5D

WISCONSIN UNIV.-MADISON. DEPT. OF MECHANICAL; AND WISCONSIN UNIV.-MADISON. DEPT. OF AGRICULTURAL ENGINEERING.
Improvement and Evaluation of Techniques for the Mechanical Removal and Utilization of Excess Aquatic Vegetation,
W79-01584 4A

WISCONSIN UNIV.-MADISON. DEPT. OF SOIL SCIENCE.
Improved Techniques for Marking and Sampling Band-Applied Fertilizers and Pesticides,
W79-01709 5A

Evaluation of Nitrapyrin as a Means of Improving N Efficiency in Irrigated Sands,
W79-01847 3F

Effectiveness of Nitrapyrin in Controlling Nitrification of Fall and Spring-Applied Anhydrous Ammonia,
W79-01849 3F

Temperature Dependence of Water Uptake by Plant Roots,
W79-01910 2I

WISCONSIN UNIV.-MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin, Appendix II,
W79-01530 4A

WISCONSIN UNIV.-MILWAUKEE. DEPT. OF BOTANY.
Environmental Status of the Lake Michigan Region, Volume 11. Natural Areas of the Lake Michigan Drainage Basin and Endangered or Threatened Plant and Animal Species,
W79-01555 6G

WISCONSIN UNIV., MILWAUKEE. DEPT. OF ZOOLOGY; AND WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
The Effects of Intermittent Chlorination on Coho Salmon, Alewife, Spottail Shiner, and Rainbow Smelt,
W79-01753 5C

WISCONSIN UNIV., STEVENS POINT. DEPT. OF BIOLOGY; AND LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF ZOOLOGY AND PHYSIOLOGY.
Effects of Turbidity and Suspended Material in Aquatic Environments, Literature Review,
W79-01656 5C

WOODS HOLE OCEANOGRAPHIC INST., MA.
Controlled Ecosystem Pollution Experiment: Effect of Mercury on Enclosed Water Columns. VIII. Summary of Results,
W79-01691 5C

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Energy Resources Development in Wyoming's Powder River Basin: An Assessment of Potential Social and Economic Impacts,
W79-01545 6B

ACCESSION NUMBER INDEX

W79-01501 5B
W79-01502 4A
W79-01503 8B
W79-01504 5B
W79-01505 5B
W79-01506 2C
W79-01507 5A
W79-01508 4B
W79-01509 2A
W79-01510 4A
W79-01511 2H
W79-01512 7B
W79-01513 8F
W79-01514 5B
W79-01515 6G
W79-01516 2F
W79-01517 5A
W79-01518 8B
W79-01519 8B
W79-01520 8D
W79-01521 7B
W79-01522 5B
W79-01523 4D
W79-01524 2L
W79-01525 8B
W79-01526 8B
W79-01527 2C
W79-01528 4A
W79-01529 4A
W79-01530 4A
W79-01531 4A
W79-01532 4A
W79-01533 4A
W79-01534 4A
W79-01535 5B
W79-01536 6E
W79-01537 3B
W79-01538 2B
W79-01539 5B
W79-01540 5C
W79-01541 6E
W79-01542 5B
W79-01543 5C
W79-01544 5D
W79-01545 6B
W79-01546 3E
W79-01547 5E
W79-01548 5E
W79-01549 8F
W79-01550 2K
W79-01551 2K
W79-01552 5B
W79-01553 5A
W79-01554 5A
W79-01555 6G
W79-01556 2G
W79-01557 2G
W79-01558 2G
W79-01559 2G
W79-01560 2G
W79-01561 6A
W79-01562 3B
W79-01563 2I
W79-01564 2I
W79-01565 5D
W79-01566 5D
W79-01567 2K
W79-01568 2B
W79-01569 6B
W79-01570 4A
W79-01571 2G
W79-01572 5D
W79-01573 5D
W79-01574 5D
W79-01575 5D
W79-01576 5D
W79-01577 5A
W79-01578 5A
W79-01579 5D
W79-01580 3A
W79-01581 5D
W79-01582 3A
W79-01583 5D
W79-01584 4A
W79-01585 6B
W79-01586 3B
W79-01587 5G
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W79-01995	5A
W79-01996	5C
W79-01997	5C
W79-01998	5C
W79-01999	3F
W79-02000	5C

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-01511, 01673 01679, 01686 01689--01690 01692--01693 01699, 01702 01704--01721 01732--01734 01736--01737 01751--01752 01754, 01761 01766, 01775 01777 01781--01782 01785--01786 01826, 01841 01847, 01849 01879, 01885 01910, 01990 01999	53
Cornell University, Policy Models for Water Resources Systems	W79-01731	1
East Central Oklahoma State University, Agricultural Livestock Wastes	W79-01605, 01628 01633, 01640 01649, 01671	6
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W79-01667--01670 01672 01674--01678 01680--01685 01687--01688 01691 01694--01697 01700--01701	25
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-01703, 01729 01757--01760 01762--01765 01767--01774 01776 01778--01780	22

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
Illinois State Water Survey, Hydrology	W79-01501--01510 01512--01534 01724--01728 01735 01911--01977	106
Institute of Paper Chemistry Water Pollution from Pulp and Paper Industry	W79-01593--01596 01599--01604 01606--01627	32
National Water Well Association, Water Well Construction Technology	W79-01549	1
University of Arizona, Arid Land Water Resources	W79-01730	1
University of North Carolina, Metropolitan Water Resources Planning and Management	W79-01827--01840 01842--01846 01848 01850--01859	30
University of Wisconsin, Eutrophication	W79-01993--01998 02000	7
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-01536--01548 01556--01561 01563--01572 01587--01592 01645 01722--01723 01738--01750 01886--01908 01979--01988	84
C. OTHER		
Army Engineer Waterways Experiment Station	W79-01655--01666	12
BioSciences Information Service	W79-01550, 01698	2

ABSTRACT SOURCES

URCE	ACCESSION NUMBER	TOTAL
OTHER (CONTINUED)		
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-01552--01553 01653, 01753 01755--01756	6
Environmental Protection Agency	W79-01647	1
Information Planning Associates, Inc.	W79-01535 01573--01583 01585, 01654 01989	15
Ocean Engineering Information Service (Patents)	W79-01860--01878 01880--01884	24
Ocean Engineering Information Service (Outer Continental Shelf)	W79-01783--01784 01787--01825	41
Office of Water Research and Technology	W79-01562, 01586 01909, 01978	4
U. S. Geological Survey	W79-01551	1
University of Massachusetts (Wetlands)	W79-01629--01632 01634--01639 01641--01644 01646, 01648 01650--01652	19

U.S. GOVERNMENT PRINTING OFFICE: 1979-281-061/16

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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